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ABSTRACT

This collection of delivered papers at the seminar on information needs and utilization in the 1980's comprises the keynote address, "Information in the 1980's" by Donald Fink, and presentations from three panels. The first panel, moderated by Joel J. Lloyd, includes the following: "Aspects and Characteristics of the Future Information Society" by Mary Jones, "Progress in a Developing Country" by Jose Perez Alvarez-Ossorio, and "The Determining Characteristics of the Time-Space Framework of Our Environment and the Special Nature of the Information That Will be Needed" by Dale Baker. The second panel addressed the new media, techniques, and mechanisms for the 1980's and was moderated by J.R. Smith. Papers included "The Information Industry, an Invisible Industry" by Isaac Auerbach, "Shall We Be Ready In the 1980's?" by Nathalie Dusoulier, and "Information Techniques and Mechanisms for the 1980's" by Derek Barlow. The third panel's papers included "Some Considerations on Information Transfer for Developing Countries" by Adam Wysocki, "Global Political Factors" by Lee Burchinal, and "Information Systems in the Context of a New International Economic Order" by John Woolston. This last panel was moderated by A.K. Kent. Concluding remarks were by Jorge Sahade. (RAO)

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INFORMATION DEMAND AND SUPPLY FOR THE 1980'S

Proceedings of a seminar organized by
ICSU AB at the
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June 23-24, 1976.

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FOREWORD

Mankind is becoming aware of new requirements and conditions for survival and well-being : the necessity to husband the earth's resources ; to place greater value on the purity of his air and water ; to recognize the compelling reasons for extending the solidarity of plenty into every corner of the world. These are some of the factors that are leading us into a post-industrial age. Forecasters predict that it will be a service-oriented era in which the storage and transfer of information will assume even greater proportion and importance than it does today. It is against this background that the ICSU Abstracting board organised a seminar to examine the information requirements for the 1980's and beyond.

After a keynote address on the general topic of the seminar, three panels met to consider :

- The nature of the information oriented society of the 1980's and beyond ;
- The new media, techniques and mechanisms required for information transfer in the 1980's,
- The political impacts of the new conditions on the world order.

These proceedings contain the papers which were presented as well as the discussions which took place during the seminar.

ICSU AB wants to express its gratitude to the US National Academy of Sciences for its hospitality and for organising the meetings ; to the eminent speakers and to the moderators who have accepted to devote their time to this seminar ; to those who have helped with transcription of the tapes of the discussions, and especially to J.J. Lloyd for editing this publication.

INTRODUCTION

Joel J. Lloyd

Consultant

National Academy of Sciences

WASHINGTON, U.S.A.

There have been unfortunate but unavoidable delays in the publication of these Proceedings, but like good wine given time to age, the lapse has served to accentuate the quality of the papers presented here, and the maturity and high standard of the discussions they evoked. I cannot remember, in the many years that I have been attending Information meetings, another symposium that brought together as distinguished and thoughtful a panel, nor one attended by as knowledgeable and serious an audience. I usually am not given to dealing in hyperbole, but my reading and rereading of these contributions at the various stages of preparation has brought me to this mood.

It is my feeling that an editor owes something to the readers, beyond his obligation to the authors and publisher. To those of you who participated, I apologize for any vagary that may have crept into the tape-transcription of the discussion session. We Americans have learned to take tape vagaries in our stride. But I assure you that although the discussions were selected and edited in the interest of space economy, nothing was deliberately erased! To those of you who could not attend this event, I would like to express my regrets and share some observations.

As you read the papers you will observe that not all of the invited speakers shared the same degree of conviction that we are standing on the threshold of a new age. Indeed, several would vehemently reject the concept of any impending major change in our societal structures. There was no unanimity on the shape of the post-industrial era even from those who believed in its imminence. There were differences of opinion on approaches to solving the developing countries' information problems. But the speakers were not invited with the idea of creating a chorus of harmonizing voices. They were provided with the theme and told that they had carte blanche to weave their theories or their dreams. Nor were they required to submit early abstracts or preliminary drafts for review. The selection of speakers was drawn from the acknowledged scholars of the information community with the certainty that they would bring the best thinking of many countries to the podium. We were not disappointed and I don't think that you will be while reading the Proceedings.

It is of more than passing interest that five of the speakers addressed themselves, to a greater or lesser extent, to the quality of today's information. Fink pointed out that the soft-science user's, "...are awash in an unmanageable sea of facts, data, opinions and dicta from which they must sort out the kernels of truth and wisdom and discard the seeds of error and folly." Jones suggested that, "...the average citizen... has little control over the type of facts made available to him. He is primarily dependent for information on the very persons who are seeking to influence his action." Baker wrote that in the future, readers will demand, "more relevant information" in many areas, implying that they are getting less today. Barlow reported that current information requires more analysis and that one producer is, "...reviewing all the items processed in his data base against the criteria of whether the article contains any innovation." Dusoulier, in a forthright statement asserted that, "It is very difficult to measure the (information) inflation in terms of real quantity of published information since the number of worthless scientific and technical documents also show a marked increase." It would be difficult for a knowledgeable person who follows the literature of a discipline (including the literature of information science) to contradict them.

Yet I wonder what the secondary services can do about it? Few services would contend that their abstractors are qualified to second-guess the prestigious reviewers of the primary journals. Even if they were, the overwhelming pressure of keeping up with the burgeoning volume of print and maintaining a decent appearance of current-awareness would make the writing of critical abstracts impossible. The root fault would seem to rest with the primary editors who are unable, or unwilling, to wield a merciless red pencil. The Abstracting Board might raise the problem in their committee meetings with the editors' associations, but I have little hope of it having a salutory effect. A greater impact might be made if the invited distinguished authors of review articles singled out the dross in their respective sciences and made a point of publicizing the names of those journals that provide space for bad or trivial research results.

The question of relevance is something else again. As the one-time director of an abstracting and indexing service in geology, I was frequently challenged for allowing the inclusion of irrelevant material to the data base. My reply was always instantaneous, "Who among the savants of geology in 1910 would have considered a paper on the structure of the North Sea-bed to have been relevant?" I might have added, "Today's irrelevance may be tomorrow's seminal paper." The situation could be alleviated, however, as Baker said in his contribution to this symposium, through "deeper indexing, perfect analysis, and organization of the materials (in the 1980 environment) so that retrieval of relevant materials can be accomplished in a fail-safe manner."

In his Keynote Address, Fink touched on a problem in transferring information to the developing countries that may be so difficult - or so sensitive - that it is infrequently exposed to the sunlight. He said that, "...use (of retrieval systems) cannot affect the wealth and health of a nation unless the information penetrates, in appropriately simplified form, to the people who get things done." This would seem to be so obvious that it shouldn't need saying, except that in many developing countries it doesn't happen. Indigenous personnel are being trained as information specialists, focal points are being established, all of the elements of the infrastructure are being placed with the assistance of intergovernmental organizations or developed country institutions, but the loci for dissemination does not extend beyond the capital city or the university campus. The peasant-farmer, the small manufacturer and the rural administrator, all of whom are "getting things done," are outside the radius of the local facility. Whether the problem is economic, technical, sociologic or a combination of the three, it should be considered and dealt with by the agency providing the assistance.

The Jones paper is a refreshing look at human society in the 80's. It is not a surprise that she left the needs of the scientists, engineers and the macro-decision-makers to the other speakers and concentrated on Everyman as a user whose requirements have been largely ignored up to now. Jones has been a long-time consumer advocate who has carried her flag throughout her legal career. Her vision of the future is not as distant nor as Utopian as it may seem on first reading. The hardware is in place. Home computers are being listed on department store Christmas lists. The video-disc and video-cassette are realities on the market. Telephone-coupled terminals are "old hat." The bugs have been eliminated from computer conferencing. Satellite communication is a commonplace. It only remains for the price of the equipment to drop to the level of the householder's purse, and we have all seen what happened with hand held calculators. It is true that the data bases are lacking, but we have only to see the hardware installed in enough homes and the data-base entrepeneurs will appear. Remember that television preceded the soap opera - it was not the other way around. The frightening aspect of the Jones model is possible control of the data bases. Whose finger on the red button will convert an informed democracy into a world of robots? Perhaps Auerbach sensed the same danger when he said, "As we start to control these data bases and provide uniform information to our citizenry so that they can help to make decisions, we will be moving more and more towards the totalitarian governments."

There are rare individuals whose imaginations, triggered by the phrase "post-industrial age" or "knowledge-based society" see a world without farms, or mines, or factories. Presumably the spiritual denizens of that world, devoid of the demeaning flesh, will be nourished by the strains of a

Moog Synthesizer while they huddle around the warmth of a cathode ray tube. Although they are rare, as well as rarified, it is well that someone like Perez Alvarez-Ossorio reminds them from time to time that farms and mines did not disappear when we entered the industrial era, and that neither farms, nor mines, nor factories will melt into the thin air as we leave it. Perez' data on the ratios of basic research, applied research, and development in the industrialized and developing countries are interesting statistics. It would be fascinating if some econometrician using these and similar data could project the relative contributions of all sectors of the economy to the GNP in the north and south countries for several points in the predictable future. Baker suggests that the task can be carried forward as far as 1993 with not more than 15% of error. I particularly support Baker's following statement that, "What we need is not so much the power to forecast the future, but the courage to change the future."

I believe that every society needs a Jeremiah and no wiser, nor more respected one could appear than Auerbach. I was happy that he chose to adopt that role in the symposium. It is certain, as he said, that as long as the information community remains invisible - as it surely appears to be in the developed countries - then our ability to shape a cleaner and better era will be curtailed. If we accept Baker's challenge to "shape the future" we must agree with Auerbach that, "...it is incumbent on all of us who are familiar with the information industry and it's implication, to do all within our power to assist in wakening an information consciousness about the current and future impact of the information revolution on our lives." We should enlist in this cause our closest and strongest allies, the user community of scientists, science managers, and decision makers - or those among them who have demonstrated an awareness of the role of information in their work and research. It will not be an easy campaign, but the Abstracting Board together with the library associations and the information processing societies should launch this as an international effort.

Dusoulier approached the topic with a fine-honed scepticism, and her socratic questions each contained the kernel of it's own answer. "What will be the attitude of secondary services (to primary publication alternatives) and what kind of cooperation can be expected?" "Will all types of information and knowledge really be processed and generated by the complex networks of ... facilities and algorithms of essentially the same kinds we now process?" "...when will we start receiving video-journals on our TV screens for indexing and abstracting purposes?" And much more. Lest we missed the answers, she filled in the blanks for many of them. There is nothing of the dream-boat in Dusoulier's experienced pragmatism. Rather than rhapsodize over the basket of baubles that the Good Fairy will leave on our doorsteps, she scanned the existing technologies and what we must do to adapt them, and what our efforts must be to create a meaningful change for the future. As such, the Dusoulier paper is a guideline for the secondary services. If it does not provide every answer, it has not missed many of the major questions.

If Dusoulier was the sceptic of the meeting, Barlow started out as the resident cynic. After pointing out the long gestation periods that separate innovation from acceptance on the mass market; the dashed hopes that were placed in SDI back in the 60's; the inflating costs and dwindling markets; he settled down to some serious forecasting of his own.

Barlow's depth and broad experience are a combination that cannot be set aside lightly. I agree with him that there will be, "Very little rapid change, instead it will be a period of consolidation and analysis." It is probable that change will enter "on cat's feet" gradually and unobserved. Barlow also noted that little was said at the symposium that had not been heard at the Royal Society information meeting back in 1968. I think he would agree, however, that an individual who had spent the intervening years on the moon would have difficulty in recognizing the information industry of 1978 as the one he had left in 1968. The 80's are almost upon us, but I suggest that although the changes will occur almost imperceptibly to those of us who are in the middle of it, the industry of the 80's will be as different from today's, as today's is from that of the 60's.

Wysocki's message on the developing countries left me with a certain uneasiness that I had experienced before - and since. I have no problem with those nations at the upper end of the Third World spectrum: they can utilize and maintain the high technologies of information transfer; satellite communication, the interactive online system, the whole panoply. Many of them are already doing so. Similarly they can use, and are using, the sophisticated data bases containing the latest results of more or less advanced research that we can provide. If they have a problem it is likely to be one of economics or currency exchange, and these can be resolved. But at the other end of the scale where Wysocki describes their needs as, "Minimum requirements of the family for private consumption: adequate food, shelter and clothing, household equipment and furniture," I am disturbed. I am particularly disturbed by those information specialists among us who repeatedly and publicly assert that the answer to all developing nation problems is an information infrastructure complete with trained professionals, mechanized dissemination centers, access to the most advanced data bases, and back-up resources for document delivery. These nations certainly need information. But it may be information that is so elemental that it is not stored in existing data bases. It will require a man on the ground with the patience and the language, preferably a native of the country, to transmit the knowledge orally and by demonstration. Above all it needs the sincere determination and the economic will of the local government at it's highest levels to establish this effort and to assign it a top priority. The rest must wait ten to twenty years, or for another generation if that proves necessary. We are committing a disservice to the developing country and to ourselves if we claim to hold the key, and when it is inserted into the lock - at someone's high cost and the country's inflated expectation - it doesn't turn.

The Buckland and [illegible] contributions represented the two sides of a most important question that cannot wait too long for an answer. Both are started with the sincere conviction that the developing countries must be provided with the level of information that they need and can absorb. Their presentations were thoughtful, eloquent - and opposed. If the conclusions could be encapsulated in single sentences I would quote from Buckland, 'The UN or its specialized agencies or other international bodies should not establish or promote new international bibliographic retrieval systems.... I believe it is time to declare a moratorium on developing new government-sponsored international STI systems.' And from [illegible], 'The alternative model is for each country to put its information into an international pool.... This implies a central focus in the network where the contributions of the countries are merged and from which the products are distributed. The central operations must then... be under international management and control." As might be expected, the two papers produced the liveliest discussion of the two-day meeting. Was anyone sufficiently convinced to move from one side to the other? I could not say. The subject is one, I fear, that those of us within the information community hold strong views on, with rational and emotional components that would preclude an easy switch. Speaking only for myself I would say that if I were younger I would be on one side, but having crossed the Rubicon, I am on the other.

For me the whole symposium was, in the words of a few years ago, a "happening." Fortunately it makes as good reading as it did listening. We owe thanks for that to the clarity and the literacy of the participants and the discussants. And finally, I accept sole responsibility for any offense I may have given in this Introduction whose thoughts are mine alone, and may not represent the views of the publisher, the ICSU Abstracting Board. Now turn the page and *Bon Appetit!*

February, 1978
Washington, D.C.

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KEYNOTE ADDRESS

INFORMATION IN THE 1980'S

KEYNOTE ADDRESS

Donald G. FINK

ABSTRACT

Three major problems will complicate the development of information in the post-industrial world: the development of faster and more comprehensive systems; the intensified interplay of economic, political and intellectual factors; and the paradox of the developed nations moving out of the industrialized age but faced with the necessity of assisting the developing countries in their approach to industrialization. Greater demands can be expected from social scientists for information in their areas of interest, and the satisfaction of those requirements will be complicated by difficulties of classification and terminology that are less structured than those of the hard sciences. The "property right" will exist in the information society as strongly as it does in the industrial society and we must be alert to the danger that could arise from the formation of cartels and combinations in restraint of trade. Although new and more efficient hardware is envisioned, the key component of the new society will still be trained people.

INFORMATION IN THE 1980'S

KEYNOTE ADDRESS

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Mr. President, members and guests of the ICSU Abstracting Board :

It is my particular pleasure to welcome you to this Symposium in Washington and to join you in looking ahead to the next decade. We are here to divine what is to come in our chosen fields of information science and technology. Although the time scale of our forecast is modest, the task of looking ahead even ten years is made difficult by three forces.

The first of these is the headlong pace at which new, faster more accurate and comprehensive systems of information acquisition, communication and distribution are appearing. The second is the transformation in the interplay of economic, political and intellectual forces, as industrialized nations enter the so-called post-industrial society.

The third is the realization by the countries of the third world that only by drawing on existing storehouses of information appropriate to their needs, can they assure their people of higher standards of living, health and self-dependence.

These are dynamic, exciting times, pregnant with new opportunities for all of us here. They are also unsettling times, for the winds of change affecting information science pose serious threats of disruption, vain effort and conflict. It is the task of this Symposium to illuminate these opportunities and threats, and to seek to find plans whose execution will avoid the pitfalls ahead.

I know of no organization anywhere in the international arena better qualified, more highly respected, with more adequate resources to provide the insight for these tasks than the ICSU Abstracting Board. But when we consider the anticipated demand for information in the 1980's, we are struck by a shift in emphasis toward professions and disciplines that do not lie in ICSU's accustomed domain. In the 17 fields of pure and applied science represented by ICSU's Unions, and in the associated fields of engineering, information science has a well-established beach-head. But we can expect the future to demand equal strength of data structure and systems in alien fields, known to us only at a distance. Fields such as economics, politics, law, the social sciences, and the worlds of business and finance. Indeed, we can expect that all these will be prominent in their demands for worldwide information exchange in the next decade.

In this broad context of the information needs of all the professions, hard and soft, we find an unfamiliar situation. These professions at large are awash in an unmanageable sea of facts, data, opinions and dicta from which they must sort out the kernels of truth and wisdom and discard the seeds of error and folly. The great decisions of our age, so clearly required for the survival of civilized mankind, must be made by leaders who start from ignorance and are plagued with misinformation, but who by reference to reliable information, timely found and correctly assessed, can lead us on a narrow path to a safe, abundant and rewarding future.

We in science and engineering can be pardoned for viewing this wider scene with some distaste and uneasiness, bred by unfamiliarity with the work of others and by pride in our own. But we cannot stand aside. The theory, techniques, hardware and software of the information systems designed initially for science and engineering are equally applicable to the needs of all professionals. Granted, the structures of language and knowledge in these fields differ widely as, for example, between political science and chemistry. Certainly, we cannot expect equal efficiency and efficacy of storage and retrieval in such diverse fields. But neither can we expect the expert practitioners of economics, law, and politics to stand willingly aside.

There is, in fact, evidence that the breadth of our concern in information science is widening. UNISIST, from its inception, held open the door to the eventual inclusion in its work of the social sciences. That eventuality came to pass last year, when the UNISIST Steering Committee formally decided to include the social sciences in its programs.

More immediate evidence of the new breadth of coverage comes from the recently issued list of machine-readable data-bases now on file in one of the two larger direct-access computer-search services in the United States. As of earlier this year, the Lockheed Dialog System offered only nine data bases in the sciences and engineering, and twelve in education, psychology, social and business fields. The total number of citations and/or abstracts in these 21 files is nearly 8 millions.True, the lion's share (about 80%) of this vast array of file entries lies in science and engineering. But the files from the other side of the house are, by and large, new ones with great growth potential.

By 1980, I believe, we can confidently expect that information science will not be the special preserve of the scientist, as he often assumes it to be today. Rather, it can well become the meeting ground of all the professions. If this turns out to be true, then supply and demand, the themes of this Symposium, will play their roles in a new market. I do not contend that ICSU/AB should then depart from its firm base in science and engineering to walk boldly into the morass of the superstructure and infrastructure of the social sciences. I do contend, however, that the Abstracting Board will have company in other fields and, perhaps, competition for funds and attention.

That information requirements will be broadened and deepened in the next decades can hardly be doubted by those who embrace the concept -- mentioned in the program brochure of this Symposium -- of the post-industrial society. There are important implications of this new societal structure for information science and technology, so it is appropriate here to outline some of the ideas propounded by one of its major prophets in the United States, Dr. Daniel Bell of Harvard University[1]

It is Bell's thesis that society, in the nature and use of its resources, has come through two stages, pre-industrial and industrial, and is now entering a third stage, the post-industrial society.

In the pre-industrial society, resources were extracted from the land and the sea, power was supplied by wind, water and the muscles of animals and humans. Its key workers were artisans, manual workers and farmers; its strategic resources were raw materials; its technology was craftmanship and common sense. Most of these are no longer at center stage, although the extractive arts continue in modern dress.

They have been replaced in the present industrial society by a machine-oriented technology, with fabrication of goods and construction as its main preoccupations. The natural power of land, sea and muscle has been replaced by the created power of electricity, gas, coal, oil and nuclear reactions. Its strategic resource is financial capital. The primary skills it employs are those of the engineer and the semi-skilled worker. It is devoted to experimentation and an empirical approach to its guiding principle, economic growth. In addition to the value-directing functions of capital, value is increased by labor, individual and organized.

Now, says Professor Bell, comes the post-industrial society, at least in the Western nations. The post-industrial society to him, is "an information society." Its basic economic sectors are not the primary occupations of extracting from land, sea, nor the use of muscle, nor yet the secondary occupations of producing manufactured goods. They are new central occupations : the rendering of services. He lists several of these services: transportation, utilities, trade, finance, insurance and real estate, health, research, education, government and recreation.

Not, says he, that the extractive and the manufacturing arts will disappear; they will be as evident as ever. *But*, he believes, they will *not* be central to the power structure of society.

What significance does the prospect of the post-industrial society have for information science and industry? To me it poses both a great opportunity and a great threat. The opportunity is to broaden the range of application of our systems and techniques so that they can embrace the non-science and non-engineering professions as well as they now meet the needs of scientists and engineers. This is no mean task. The mechanisms, the computer hardware and software, need not be altered greatly, but the classification schemes and key words are challenges of major proportions. Chemistry is almost unique in the highly structured coherence of its language. Most of engineering is much less simply organized, although it has been managed reasonably well in most of the major fields.

Thesaurus writing for the social sciences, most notably political science, can be a nightmare of contextual subtleties and overlapping meanings. Just one example: the word "state", much used by international politicians, in the Oxford English Dictionary has no fewer than 110 definitions covering six large pages of type.

Free expression (meaning inexact expression) is not likely soon to be tightened in law or politics. So the classification task is great, and the precise recovery of subject matter correspondingly difficult. But, the importance of precedents to law and legislation is such that one can be confident that even an imperfect information system is better than none. The alternative is, too often, mere inadvertence.

The threat posed by the prospect of the post-industrial society, with which all information practitioners must deal is the common thread through all three of professor Bell's societies: the property right, be it the ownership of a farmer's field, a manufacturing plant, or a computer data base. If, indeed, access to information will decide who wins the battles for power, prominence and wealth, we can expect that the open spirit of the information marketplace as it exists today to be threatened by the spirit of the cartel.

There is too much classification of information, under various proprietary guises, as it is, today. As we move into the post-industrial society, the temptation to keep more information closer to one's chest for private use and gain will increase. I am sure that this threat is one of the points Dr. Bell makes in his reference to the political importance of the national information policy.

It has been said that America's industrial strength can be traced directly to the enforcement of the Sherman Antitrust Act against combinations in restraint of trade. We may yet need similar legislation against combinations in restraint of the public exchange of information.

The need for careful planning for the post-industrial period is now recognized in the chancelleries of the world. For example, in the United States, Vice President Rockefeller wrote President Ford as follows, and I quote :

"Many commentators have noted recently that the United States is increasingly becoming a society that produces and sells information (such as knowledge and technical know-how) rather than goods. This is a key characteristic of what has become known as the Post-Industrial Society." He goes on to say that"... The American economy is shifting from the production of goods to the production, storage and management of information. Information is becoming both a raw material and the end product of the work of increasing numbers of Americans."[7]

In this respect, the U.S.A. is by no means unique in the family of industrialized nations.

I would now refer to the most complicated and frustrating tasks in international scientific and technical information programs: providing appropriate information resources to the Third World -- in truth, not merely in appearance.

Information science has been prone to oversimplify its problems, whenever it starts on a new task. It seems that we spend almost as much time back-tracking from unworkable proposals as we do going forward with workable ones. In its proposed impact on the less developed nations, the information resources of the industrialized nations were once thought to be directly transferable to the intellectual community, however small it might be, in each of the Third World countries desiring to partake of them. You would install a terminal, and find a wealthy foundation or Government to pay the bills.

We now know better. Successful employment of information everywhere, but particularly in the developing nations, starts with people -- not mechanical and electronic devices. The intellectual community may be able to use the outputs of a currently available retrieval system, but such use cannot affect the wealth and health of a nation unless the information penetrates, in appropriately simplified form, to the people who get things done.

The institutions that relate the knowledgeable class with the user population, too often have been set up to separate, rather than unite. Dealing with these human and institutional problems is now a first-order priority. Second, by a long distance, comes the provision of automated terminals for search and retrieval. FID CR's contribution to this important and complex area of information science is, therefore, a special problem which will be clarified and formalized in this meeting and others to follow.

By 1985, if not sooner, the United Nations plan to set up an international network, especially tuned to the needs of the developing nations, is expected to come to fruition. If so, the supply and demand for information in the 1980's will have a wholly new component of considerable complexity, involving as it will the adaptation of existing information resources to a whole spectrum of nations at different stages of development, requiring different means to raise their respective standards of living and self-sufficiency.

Finally, I am certain that in the Symposium to follow, there will be voices raised to point out the dangers of uncoordinated conflict between national information services (both in the public and in the private sectors) and international ones. The latter, by economy of scale if not by outright subsidy, can outbid and bypass the national services. If this happens, I can think of no more exact parallel than the parable of killing the goose that laid the golden eggs.

Getting information into the data base, completely, disinterestedly, knowledgeably, timely and efficiently, requires irreplaceable resources of experience, trained man- and woman-power and management expertise. If these resources are injured or destroyed, the buyer of access to the data base could find himself with a subsidized price for an obsolescent and deteriorating product. We have learned many lessons in information science the hard way, and we don't need a course in biased economics.

1. Bell, Daniel. Welcome to the Post Industrial Society. Physics Today: February, 1976; p. 46-49.

2. The Memorandum to the President, dated December 17, 1975 was answered over the signature of Gerald R. Ford on March 8, 1976. In his reply the President said, "I have reviewed your memorandum of December 17, 1975, concerning the need to develop a conceptual framework for addressing emerging information issues, and I concur in your assessment that there is a need to better coordinate and direct the way in which government policy is made in this important area.

   As a first step in dealing with this matter, I am directing the Domestic Council Committee on the Right of Privacy, of which you are the chairman, to: review and clearly define the information policy issues which confront federal policy-makers; ascertain the status of information policy studies now going forward within a number of agencies of the Executive Branch, and: report to me by September 1, 1976, with recommendations on how the federal government should organize itself to deal with these information issues."

   The exchange of memoranda led to the publication of National Information Policy: Report to the President of the United States, by the Staff of the Domestic Council on the Right of Privacy, published by the National Commission on Libraries and Information Science (NCLIS), 1976, Washington, D.C.; 233 p. The Report is available from the U.S. Government Printing Office as Document No. 052-003-00296-5.

ed.

PANEL I

THE NATURE OF THE INFORMATION SOCIETY OF THE 1980's AND BEYOND.

Moderator : *J.J. LLOYD , CISTIP*

The Future is a world limited by ourselves.

Maurice Maeterlinck.

ASPECTS AND CHARACTERISTICS OF THE FUTURE INFORMATION SOCIETY

Mary GARDINER JONES

ABSTRACT

The impact of an information society can be significant on the average citizen who has become alienated, cynical and mistrustful of today's society. He is presently without control and dependent for consumer information on those forces that will benefit from influencing his decision. Full information about broad social, economic and political issues is difficult to obtain, and if obtained, the mechanism to express his opinion is antiquated or non-existent. The agency to restore this information imbalance may become available. Developments in telecommunication have a great potential for redress; vast data banks of consumer needs may be reached through home terminals; two-way communication can be established; and "town-meeting" type assemblages can be arranged through computer-conferencing. Direct participation in legislative, executive and administrative decision-making may become possible. The changes will not be overnight nor without major dollar investments, but society, in response to citizen demands, can ultimately find a formula.

ASPECTS AND CHARACTERISTICS OF THE FUTURE INFORMATION SOCIETY

Mary GARDINER JONES

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Democracy is the most fragile of institutions. Watergate gave us a glimpse of its fragility. India's recent experience presents another example. Here traditional democratic liberties and institutions may be perishing because of leaders concerned with the need to act decisively and a too compliant people bitterly tired and frustrated with continued injustices and unresolved problems.

Democracy requires a large tolerance for uncertainty, a realistic basis for hope and confidence and-- most important-- a deep sense among the populace of their capacity to cope with their problems and to control and influence the direction of their lives.

Yet an increasing number of citizens see themselves too often as helpless pawns in decisions and events which swirl around them. The very affluence and technology which has contributed to their increased well-being has at the same time confronted them with vastly broadened areas of choices and with the need to react to situations in their communities or in the nation. These are no superficial needs, for they deeply affect their livelihood, the quality of their life style and indeed the entire fabric of their lives and that of their families.

Today, the average citizen has few independent sources of meaningful information to which he can turn in order to obtain the facts which he needs to make his decisions and to understand the issues which are daily pressed upon him. Moreover, too often he has little control over the type of "facts" made available to him. He is primarily dependent for information on the very persons or institutions who are seeking to influence his actions.

In the marketplace, he confronts high technology products and services which he does not understand. His enlarged affluence opens up for him a wider range of community, medical, educational, recreational and other services which also create new information and evaluative needs.

Finally, the average citizen today can no longer remain oblivious to, or unconcerned about, the broader social, economic and political issues confronting our society. Questions whether to permit stripmining of coal or clear cutting of timber ; how to protect our dwindling supplies of energy ; whether the Concorde should be permitted to land in New York or Washington ; what levels of safety should be insisted on in the manufacture of products; and even the seemingly more esoteric issue of deregulation are not simply issues which politicians argue about or which are the sole concerns of a few special interests or citizen activist groups. Resolution of these issues can affect the livability of whole communities as well as the economic and personal well being of individuals. They require decisions on priorities and trade-offs between equally desirable social goals of safeguarding the environment vs. demands for energy ; social programs vs. taxation levels; foreign aid vs. domestic needs, and the like.

The ordinary citizen is essentially unprepared and unequipped to formulate positions on these various issues. Equally important, they also lack effective mechanisms to express and reflect their concerns and preferences and to find other citizens of like-mind who share their concerns. Yet only through collective action will their voices be heeded with the same respect and attention which business, labor and other larger institutions in our society seem to be able to command.

Knowledge is an increasingly important national resource, and access to it an important source of political and economic power. We cannot hope to reverse and eliminate the current feelings of alienation, cynicism and mistrust of authority which are so deeply engrained in the public until we confront and redress the current information and communications imbalances in our society. Yet there is a dismaying lack of concern and discussion of these needs of our citizens to make intelligent evaluations and decisions on the many complex issues and forces affecting our society. The challenge which confronts us is to appreciate the interrelationship between the survival of our democratic liberties and the need to enable citizens to be knowledgeable and effective participants in our society.

The computer-telecommunications technology is still essentially in its infancy. Nevertheless, its potential for enabling individuals to exercise realistic power over their own lives and ensure the responsiveness of the society to their needs and concerns is perhaps its most important and least recognized aspect.

Today the telecommunications technology linked with the computer and the developing facsimile and reproduction technologies has the capability of putting knowledge to work more promptly, more effectively and ultimately at less cost than ever before. It opens up new vistas of customized, as distinct from mass, communication. It can provide distance insensitive communication as well as two-way interactive audio and visual communication channels for large groups of users. So long as we rely on the mass communications-media, we will have only a one-way out-put channel for what has to be essentially homogenized information geared to the level, interest and understanding of the largest minority of anticipated viewers, listeners or readers.

By using the new technologies, communications for the average citizen in the absence of face to face contacts need no longer remain solely unidirectional when more than two people are involved. The new technologies make possible instantaneous communication between small or large groups of people without regard to their actual geographic dispersion. They can, for the first time, provide feedback mechanisms which can greatly enrich and make more effective, real dialogue between people.

With the advent of communication satellites, nations and communities, individuals and groups, regardless of terrain or distance, can be interconnected at substantially the same cost by voice, sight or written message. The networking capability of telecommunications technology enables the establishment of communications-channels among special interest groups whose members can be widely dispersed geographically. The broad spectrum of channels available for satellite communication and the joining of terrestrial and satellite communications and computer technologies converts mass communications into a much more customized data system. Further, the available technology offers a vast array of programmatic options tailored to the variety of viewer/listener interests, cultural, social and ethnic backgrounds and education levels.

The interrelationship of computer and communications network technologies opens up a vast area of memory storage and relay services for individuals which, linked with home terminals, will permit the dissemination of information on command [illegible] a form and detail corresponding to their needs and desires.

Though the establishment of specialized community or nationwide data banks, essential information about product characteristics, comparative price information or the repair performance records of nationally sold products can be locally captured and stored.

Data on product reliability and safety, or on complaint, repair and recall records of particular products or of particular merchants can be as readily available to consumers as their credit rating is available to the merchant with whom they deal.

Comparative information about insurance policies and coverage, availability of social security or medicare benefits, employment opportunities and other relevant information can be centrally recorded. Essential data about hospital, nursing homes and clinics, day care centers or other community facilities -- such as the number of physicians, nurses or attendants on duty, charges and fees, office hours, any special equipment and laboratory facilities on hand, the frequency with which certain types of highly specialized operations have been performed by the physician or at the hospital-- all can be stored for citizen reference and use. Similar data about local or regional educational institution facilities, graduates, curricula offerings and professional backgrounds and experience of instructors and administrators, or about the fees and specialities of local attorneys or physicians can also be made available.

The possibility of networking local and regional information systems throughout the country or even ultimately throughout the world when needed, will greatly expand the citizen's access to the information which he needs in order to function effectively in today's technological and mobile society .

Other projected home applications for the computer-communications technology within the foreseeable future will enable the citizen to carry on a broad variety of consumer transactions at home without the need for calling upon intermediaries who are frequently uninformed, busy or indifferent to the customer's concerns and needs.

Computer technology can be utilized to keep household accounts, plan nutritious meals, assist in purchasing decisions -- all via push-button telephones or terminals or other communications devices with voice or written output to answer queries or to carry out complex calculations, library searches or the like. Banking services, motel and plane reservations, the ordering of groceries and other products-- are all potentially capable of being performed by the individual while sitting comfortably at home calling upon the CRT screen all of the relevant preliminary data about prices, product or service features, schedules and reservations availabilities.

Theoretically, it is technically possible for every citizen to have at his fingertips the equivalent of the entire catalogue index of the Library of Congress, any number of world wide telephone and Telex directories, plus an infinite variety of substantive information on an endless number of subjects. Moreover the home terminal, or push button telephone, has the critically important element of enabling the consumer, rather than the information disseminator, to determine the quantity and level of information to be delivered. The limitation, of course, is the quality of information originally stored in the data bank.

Magazines and newspapers can be delivered electronically directly into the home. They can be captured permanently or not at the homeowner's discretion through some form of dry copying or printing technology. If entire magazines or newspapers are not desired, it is entirely feasible for citizens to be able to provide the knowledge bank which disseminates them with an interest profile and thus call forth only those articles and news items in designated subject areas which fit their profile. Alternatively, citizens will be able to call up on their home screen indices or abstracts of the daily press, weekly magazine or monthly journal-local, national or worldwide - so that they can pick and choose the reading matter for that particular day or week in which they are interested.

The video discs scheduled for entry into the market within the next twelve months provide another type of combined sight and sound information and instruction capable to a limited extent of being manipulated by the users to meet their particular learning and interest levels through freezing a frame, changing the speed or repeating a section. Movies, documentaries and other video/audio materials, capturing events, entertainment or instructional materials can now be stored in the home on these video discs playable on command at the householder's choice and discretion.

In summary, whether entry into the home is via coaxial cable, optical fiber, laser beam, conventional telephone wire, roof top antenna, video disc or other technique not yet designed, it is clear that the information society in which we live can be as much at the fingertips of the householders as it is to the Pentagon, the government agency, the researcher and scientist or the large business organization.

A second vitally important use for the new communications technology is to facilitate public understanding, discussion and expression of views on issues of central importance to the body politic.

Democracy in this country has suffered because of the very limited opportunity which the periodic franchise presents to the public to reflect its attitudes on all of the myriad of issues which affect the welfare of the citizenry. Moreover, direct citizen participation in the legislative, executive or administrative decisionmaking processes themselves is limited both by the public's inability to acquire the information needed to form opinions on the issues involved and by the unavailability of appropriate channels for them to express their views and preferences on particular issues in effective, significant and timely ways.

Today, the necessary legal structure and psychological climate for more meaningful and effective participation by citizens and citizens' organizations in the decisionmaking processes of an increasing number of institutions is effectively in place. What is important now is to design and adapt the information and communications technologies so as to facilitate and promote a wider public participation in decisionmaking and ensure a more widespread public understanding and oral expression of views with respect to the issues to be decided.

There is little doubt that in order to be effective, it is essential in our pluralist society that likeminded and interested citizens and citizen groups identify each other, share their mutual concerns and act collectively if they are to shape and influence the decisions being made by others which so deeply affect the type of society in which they live.

Unfortunately, however, most citizens' groups operate under serious cross informational and intercommunication handicaps in their efforts to grapple with issues of concern, to formulate positions and to inform and influence the decision-making bodies who have the power to act on these issues.

Many citizens' organizations play important roles in disseminating issue-oriented information to their members and in reflecting their memberships' views on major issues to their state or federal legislative bodies. However, their dissemination of information, while important, is typically a one-way communication designed essentially to keep its members informed of the organization's activities and of external developments, events and activities of interest to the membership. Occasionally, the information flow is reversed and the members' views on particular issues are polled or otherwise solicited.

The opportunities for members to meet together, discuss issues and share ideas is typically limited to the annual convention, the periodic meetings of committees or to meetings of local chapters. Moreover, because of time and financial constraints, many members of organizations cannot take advantage of even these limited opportunities for such two-way dialogue and discussion which is so essential for the individuals to be able to understand issues and develop their own opinions and positions.

A further handicap under which citizens organizations operate in their efforts to provide information and to influence decisions of concern to their members is the relatively small number of issues which these groups can consider and take positions on in any one year. Few organizations are able to speak for their membership without having gone through relatively elaborate processes - which can take a minimum of a year and sometime two or more - to ensure that the organization position reflects the views of their members. Moreover, the ability of these citizen organizations to play their educational and representational role for their members is directly affected by the size and affluence of their membership. The larger the organization, the greater its resources but also, unfortunately, frequently the slower its response capability in reacting to public issues. Moreover, the larger the organization the more difficult it may be to find the points of commonality of interest which will permit strong stands to be taken on issues of controversial and public importance.

Quite apart from the information and communication problems which citizens have in their organizational efforts, there are even greater numbers of citizens who are not organizationally or issue oriented but who nevertheless find themselves grappling with issues which involve matters of very direct importance to them. These citizens are subjected to a constant barrage of facts, arguments, and conflicting claims about a vast of array of issues on which they have little independent knowledge. They are confronted with the dilemma of having to understand and resolve all of the various conflicting facts and claims or to simply stand to one side while the issues are ultimately decided for them on grounds which are frequently not disclosed or for reasons which may not seem to reflect their interests in any way.

The new technology offers hope to groups and individuals that these handicaps can be overcome or at least minimized. It has the capability of enabling likeminded citizens to have ready access to whatever data they deem relevant, to forge effective communication links among themselves, and at the same time create productive interactive dialogue with decisionmakers. Because of its distance insensitivity and networking capabilities, the communications technologies can bring together widely separated groups and facilitate real time exchange of views and information both written or oral.

Without a communications network, initial concerns or protests over issues frequently peter out or end in frustration because of the inability of the members to sustain their cohesiveness and concerns over the period of time necessary to accomplish their goals. With a communications network, such protests or concerns can ebb and flow with the circumstances and the participants will always have the knowledge and potential of reconstituting themselves whenever action or discussion or simply an exchange of views or information is necessary.

Teleconferencing and video conferencing can provide mechanisms for citizens groups to "meet" electronically and discuss their common concerns either in written mode via teleconferencing or in audio/visual mode via video-conferencing. The member who in the past felt as frustrated and powerless in the decision-making process of his own organization as he felt in his capacity as citizen vis-à-vis the body politic can now "participate" in a real time framework in the deliberations of his peers without leaving his home or at least his community. Either home or community based terminals permitting exchange of written views, hard copies of the entire conference or meeting record or of certain parts of it, as well as the exchange of private messages with selected individuals can convert the annual convention or meeting typically attended by only a fraction of the group's membership into a genuine meeting of all of the group members willing to plug in. Closed circuit video conferencing can bring together small or large groups for one way interactive video-audio exchanges whenever the occasion demands with little more than a day's notice. By the same token, public hearings or debates which, if publicized at all, have up to now been an essentially one-way video or audio broadcast mode communication, can in the future be interactively structured either for observers or for persons desiring to participate and present views. In essence the new technologies offer the possibility of recreating electronically the type of town meeting discussions and consensus building which is the bedrock of genuine citizen control of democratic processes.

Surveys indicate that the public is far more issue oriented today than ever before. At the same time the percentage of citizens voting in elections has been progressively declining. It is perfectly feasible today for organizations, legislators or decision-makers of all kinds to poll the views of their members or constituents in a national or local referendum or plebiscite on a variety of questions and issues which may be the essential building blocks in the decision-making process. Periodic citizen polls pinpointed to particular issues may constitute a far more effective and responsive mechanism for our democracy today than the more familiar lock-step two or four-year elections. Moreover, carefully articulated issues on which citizens are asked to reflect their views can be preceded by equally delineated debates, exchange of data and discussion which can provide the information and analysis component so seriously lacking in today's democratic arena.

It is clear that as a nation we have no dearth of information resources. Our challenge is how best to apply these resources in the service of individuals and to the maximum benefit of our society. There is little doubt that the relatively unplanned public-private interactions, the joining of the launch capacity and technology of the government with the innovative developments of the private sector, have resulted in bringing on stream in this country fully operational domestic satellite communication systems able to serve important commercial and governmental uses. The valuable experience gained in the development of the technology is an important service to the public.

We must resolve the fundamental economic questions involved in the broad application of these technologies discussed here. Implicit in this discussion will be a consideration of what role, if any, the government should play. Decisions must be made on whether the needs of individual members of the public will be better served by leaving the technology to develop under the private market incentives of responding to commercial needs or whether some form of additional government intervention is necessary in order to speed up and influence the application of the technology of the home and community. Decisions must be made on whether government intervention may also be necessary or desirable in order to subsidize the "wiring" of the community or the home, to establish store front type or auditorium community facilities equipped with terminals and other hardware to be used by the public for its various telecommunications needs, or to set aside certain parts of the spectrum for satellites serving different portions of the public's telecommunications needs.

A second problem area which must be delt with is the delineation of which telecommunications modes are most advantageous for which uses. Research is currently going on in this area which can help determine whether there is a public interest in promoting teleconferencing or video conferencing as a communication channel between citizen organization members or among legislators and their constituents or as a supplement or substitute for the typical legislative or administrative hearing.

Critical to the desirability of promoting the application of the computer-communication technologies to the individual householder -- citizen group is careful analysis of the impact of computer interactive communication modes on human learning, information gathering and retention and educational instructional processes. Some of the questions which will require research will be whether the totally impersonal voice or printed response of the computer is a more effective mechanism for transferring information than a human source who may be sensitive, patient and responsive or indifferent, impatient or hostile; how is human communication affected by voice tone or accents, articulateness, facial expressions, dress, and other nonverbal communication symbols? In essence, we must learn about how human learning takes place and whether there are special uses for unidirectional communications addressed to persons who of necessity must remain essentially as passive recipients as well as for interactive communications in which all participants are actively involved in the content. It will be critical to establish whether information transfers made in an emotionally neutral nonpersonal fashion are as effective as the more traditional interpersonal communication modes.

A third area of issues raised by these applications of the new technologies concerns the impact on the public of a potential information overload, problems respecting the sources, quality and dissemination of the information and the effects on the public of the potential loss of traditional gatekeepers of our principal information channels existing today -- the publisher, the newspaper or magazine owner, the broadcast networks and the like.

Over the years, we have seen the people who are responsible for technology breakthroughs become frustrated by the political, economic and social complications which seem to delay the full implementation of their ideas. The kinds of technological changes discussed here involve substantial risks of investment. They will not come overnight, but the needs are real. The technology is feasible; and, under such circumstances, society should be able to find a way.

DISCUSSION

J.J. LLOYD -

I was fascinated by your whole picture, but I was also a little frightened by the prospect of sitting at a terminal in my livingroom, and having somebody cut in to take a public-opinion poll. As it is now, I am tempted to tear my telephone out by its roots and toss it out of the window at least three times a week. So, will we be exposed to that and how do we protect our privacy against that kind of intrusion? It is not our ability to communicate out, but the ability to communicate in that's alarming.

M.G. JONES -

I guess my sense is that we still have the on/off button. I don't conceive my fantasy of the future as being some kind of terminal or communication channel that can't be turned off. Indeed, the thing I am looking for is to provide citizens with the maximum ability to manipulate the information which comes to them, and turn it off. I would look at my idea of sounding out citizens' views via a poll, which could be responded to in our livingrooms, only as an opportunity to reflect our views. Let me give you an example; about a year ago General Motors announced that it had put its finger to the wind and it had determined that the American people were more concerned with saving gas than they were with pollution-free engines, and therefore they were going to gear their research to producing a more efficient mileage gasoline consumption engine, rather than a non-polluting one. Well, I will hazard a guess that General Motors looked into its crystal ball and decided that thats where the people were. In fact, there was no way for individuals to indicate what their personal trade-off was.

I think it is now available to us to speak out, as individuals, on where our trade-offs are. I agree this problem of privacy is a very real one, but I don't conceive of this as being imposed on us. I conceive of it as a wider opportunity for us to reflect where we are, and a wider opportunity to get a handle on some of the information that exists. Consumers' Union produces reports on cars. Other people will be producing reports that may be diametrically opposed on which car is the best buy, or has the best "cornering" ability, or the best mileage consumption. I think what we will be doing is trying to give people the source of information. Ideally, you will press "automobiles" and the screen will give you the index of everything you could know about that automobile. If the CRT tells you there are three different studies on gas consumption of Buicks, you're going to be in trouble, you're going to have to make a decision. You do have the overload problem, but my vision is that at least we will have it at our fingertips, and we will know the sources, and we will not be dependent simply on the manufacturer to tell us what he wants about his product.

A.A. AINES -

I think your vision is admirable and I think, quite properly, democracy will require a new capability on the part of the average citizen, to use a new technology to serve his or her needs, and at the same time to express once again the primacy of the individual over the government. What bothers me is the mechanism that's required to move from where we are to that Elysian Field. Something is needed to accomplish that. Do you think it will come out of the dynamics of our daily life, or is there a need for some intermediary that will help us reach the possibility that you talk of?

M.G. JONES -

My own sense is that if we wait totally for the private sector to provide the hardware, we will wait too long. Because I think that even a day is too long. I am an activist, and basically a regulator, I guess. So I don't want to wait until the spill-off of the current technology will peter down to the home market. I would like to see some kind of intermediary. I think that what we need is some subsidy for the hardware. I don't think that would involve the kinds of problems a lot of people have with government intervention, or invasions of privacy, by subsidizing either the wiring of communities, or the creation of terminals in the home. I see no problem in government subsidy of that kind of hardware. The software is readily available. There will be plenty of vendors of information; what we then need is some kind of data banks that can receive and transmit. Here again I would like to see some intermediary. I don't know what kind of a group but I don't want government to run the data banks. I would like to see some kind of community body, perhaps. Perhaps we will need government regulations in terms of access, both in terms of what goes in and who has the right to get it out. So we probably need a joint government/citizen group for the moment. We can start very simply with market place information. I say simply, because it has less political problems. It may have serious competitive problems but it seems to me that we can start creating the kind of community information we need about public health facilities. About doctors and the numbers of operations they performed, the office hours then have, their specialties; hospitals, the number of beds, the background of their doctors. We can start with information that is relatively non-controversial. We can develop community data banks with this kind of information. We can then start moving out into the much more difficult area of social and political information.

B. KENNEDY -

I wanted to talk a little bit about process, how do we get from here to there. One area which you didn't really address is the whole area of the legislative and regulatory framework which has to be created. Specifically, I am assuming that you are talking about cable television in the cities, computer-based information retrieval via cable television; perhaps distance communications by satellite. But in rural areas there is no way to have cable television so there has to be recognition on the part of government that has to do with either the legislative or the regulatory process, that this is all part of one single necessary telecommunications system. I wonder if you have any thoughts on what has to happen before we can get there?

M.G. JONES -

It is a fascinating problem that because we are talking about technology we have had almost no discussion among public interest groups. I am beginning to see now some movements among the groups that I am familiar with, the consumer groups, for example, some of the public interest groups. There is an organization in New York called Public Interest Satellite Association, which some of you may know. There is the Public Satellite Consortium with its more educational users, larger non-profit users. I am beginning to see some gradual recognition of some of the policy problems that are involved for individuals in this whole telecommunications area. That's a round-about way of saying that I don't think we will have public policy set, we won't have Congress really grappling with the issues until the ordinary Congressman has had some experience with some of the policy issues, and that means that as the consumer groups and other groups that will form themselves, start getting hold of these issues we will have more public discussion of the impact of what seems like highly technological problems that have important overtures to the individual citizen. But there is some citizen input beginning to develop and my hope is that we will start to get the kind of debate we are having here among less technologically oriented people and then perhaps we will be able to make some policy decisions. As to how to accomplish it, I don't think we even have our goals set yet.

PROGRESS IN A DEVELOPING COUNTRY.

Jose Ramon PEREZ ALVAREZ-OSSORIO

ABSTRACT.

Spain, on the borderline between the developed and developing world, could catch up with the industrialized states in a decade. As it moves towards an information-based society, neither agriculture nor manufacture will disappear and basic and applied research will persist. There will be, however, a changed ratio in contribution of the knowledge industries and the manufacture/extractive to the GNP. Computer terminals will be as common in the offices of industrial firms, research centers, schools, hospitals, etc., as telephones are today. A reduction of cost in information storage and transfer must be effected to produce the new society, and that effort will require greater international cooperation and a reduction of redundancy and duplication.

PROGRESS IN A DEVELOPING COUNTRY.

Jose Ramon PEREZ ALVAREZ-OSSORIO

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My contribution to a forecast of Scientific Information supply and demand in the 1980's, will be based on the experience of a country like Spain, which is still in a process of development, while it has already reached, in many aspects, a reasonable level. This situation offers the advantage of being comparable with that existing in fully industrialized countries some years ago. Therefore, by extrapolation, we can predict that our situation in the next decade, will be roughly similar to the present one in more developed countries. Unless we are wise enough to profit from the experience of others in order to speed up our development and so reduce the gap between us and the industrialized countries; and this is precisely the advantage of countries like mine. In other words, the situation of fully industrialized countries at the beginning of the 80's, could be reached in Spain by the second half of the decade.

It is generally admitted to-day that our society in the immediate future, will be a service-oriented society. Usually, the evolution of our society is described with reference to the three classical sectors of economic life: from a pre-industrial stage, dominated by the primary sector, agriculture and extractive industry, we passed to an industrial stage, with predominance of the secondary sector, and then, in the immediate future, or maybe already to-day, we shall reach the post-industrial era, where the tertiary or service sector will prevail.

Now, it seems to me, that, in the field of scientific activities, we could establish a certain correspondence with the economic sectors. In this sense, the primary sector would be represented by Research, specially by basic research; the secondary sector would correspond to technological development, or better to applied research-development-innovation as a whole. Finally, the tertiary sector would be represented by scientific information. This correspondence places the prevalence of basic research in the pre-industrial era and that of technological development in the industrial stage, while the future post-industrial era will be marked by the predominance of scientific information and its transmission.

The recent scientific history, at least in my country, agrees quite well with this concept. Before 1950, basic research already existed, with some important nuclei, while applied research and, of course, technological development were practically non-existent. During the 50's, and specially from 1958 onwards, applied research started to become important. As for technological development, its impact has been apparent only a few years ago, at the point that we can consider ourselves as an industrialized country, at least to a certain level.

Obviously, the change of emphasis from basic research to applied research, development, and information, does not mean the disappearance of the former, just as the change from the primary to the secondary and tertiary stages has not meant the total replacement of the first. Agriculture and extractive industries continue to play a fundamental role in the world, even in most industrialized countries. What happens is that their importance, in terms of participation in GNP and manpower occupation, decreases in ratio as other activities develop. Something similar occurs in the scientific field, where basic research continues to be indispensable, but its quantitative importance is reduced. This can be easily demonstrated from the relative proportion between the efforts in basic research, applied research, and development, which shifts with increasing industrialization, being about 1:3:9 for fully industrialized countries, while it is 1:2:3 or 1:3:2 for developing countries.

In the future, since we assume that the emphasis will shift to the service sector, or, to information, this will have to coexist with the maintenance of a strong research effort, as it will be impossible to transmit knowledge without creating it continuously at the same time. But the increase in the relative importance of scientific information activities could even lead to the apparent paradox of more effort and more scientists being devoted to the transfer of knowledge than to its creation.

Another generally admitted statement is that, in the post-industrial era, the lever of progress will be knowledge, in contrast with the role played by raw materials and natural resources in the pre-industrial, and by financial resources in the industrial stages. In other words, the capacity to store, systematize and transmit knowledge will be the determining element of progress.

Now, we can consider two main aspects: the content of information and the means to transfer it.

As regards the content of information, there could be observed, during the last years, a trend to look for information more and more at its source. I shall try to clarify this. Years ago, the medium for information was basically the book; this was an elaborated type of document, where information might not have been current, but it was well organized. In the second stage, where we still are, the principal medium for information is the journal article, which is the basic vehicle for communicating scientific news. But today, increasing importance is being attached to the information on ongoing research; that is, we want new scientific ideas as soon as they emerge, without waiting for its shaping, either in documents, or even in concrete working plans. This could lead to an extreme fertilization of knowledge with each new initiative originating multiple developments more or less complementary to it.

As to the means of transmitting information, there seems to be general agreement about the enormous possibilities of computerized systems and the great advances to be achieved through their generalized use; and through the improvements in telecommunications. The revolution in the scientific information world based on computer applications, and particularly on interactive online systems is quite evident. The experience of countries like mine, practically new-comers to this field, is a good example. As soon as a service of this type is established, the number of queries grows very quickly. I believe this is due, not only to the real improvement in speed and effectiveness, but also to a certain thaumaturgical character, a fascination which automatically turns into users the same people who viewed with reluctance the conventional information systems.

There seems no reason to believe that this trend will be interrupted, and in fact, the availability of online systems in countries like mine should lead to a real information "boom". This must come, however, through a substantial reduction of costs that are still very high, for equipment, terminals etc., and particularly through the improvement and cost-reduction in telecommunications. But it is not very far in the future when terminals installed in industrial firms, research and education centres, hospitals and so on, will be as common as a telephone today. An important feature, in this context, will be the versatility of the terminal, through which it will be possible to gain access, not only to scientific information, but to other types of information, like statistical, legal, administrative and so on. In fact, there are already forecasts of the number of users of online systems for the 80's. In Europe, where the present number is estimated as 60.000, it is expected to reach 960.000 by 1980, and 2.350.000 by 1985. At the same time, the cost for a search, estimated at 20-30 $ in 1976, will be reduced to 10 $ in 1980 and to 5 $ in 1985.[1]

This future of scientific information, which will be reached through a drastic reduction of costs, will require serious efforts of international cooperation, actually already existent, in a twofold aspect : the production of machine-readable data bases, accessible through terminals, and the access itself, through international networks, that will avoid unnecessary duplications.

As for the first aspect; available data bases are produced at present in a few countries and only in a few languages. But, in view of a future worldwide expansion of online systems, the less industrialized countries cannot give up the expectation that their scientific production, however modest, will be duly covered by those data-bases; and that the output information will be translated, in one way or the other, to their national languages. This is specially true, in the industrial sector where the use of the national language is often an indispensable requisite for the transfer of information. From that, we can deduce two requirements: first, the need to intensify international cooperation for the production of data-bases; second, the advancement of a promising research field in automatic translation coupled with online information retrieval systems. Something in this area is being done, for example, in the TITUS system for textile information, and I believe that in the years to come many more initiatives will be launched in this direction.

As regards international networks, much work is being done, especially by international organizations. There is little doubt that these networks will be in operation during the 80's and they will contribute substantially to the widespread use of online retrieval systems. I believe, in this context, that a principal feature of the future will be the "regionalization" of information systems. There is general agreement that international cooperation is vital in scientific information activities. Thus, it seems clear that this cooperation, among countries with similar conditions, will give the best results. And it is important, I think, not to limit the concept of a region to its strict geographical sense, but rather to take into account other factors, as common language, which are extremely important for cooperation in scientific information activities.

It is clear that to achieve this proliferation and expansion of computerized information services, significant investments will be required. There is a popular saying , in my country, that it is necessary to work very hard in order to not have to work. Similarly, we could say that considerable amounts of money will be required to reach the point of drastic reduction of the costs of scientific information services. Two opposed factors will come into play here, or rather are already. On the one hand, a decrease of economic growth will lead to a parallel reduction of funds allocated to scientific information. On the other hand, as the relative importance of scientific information as a development factor increases, it will demand a greater participation in national expenditures. The only thing is to hope that the incidence of the second factor will far overbalance the first, and will even contribute to a reversal of the trend.

Finally, in addition to the economic factor, there are the organization and infrastructure elements. Here, there is a lot of progress being made at the moment. International Organizations, particularly UNESCO, through the UNISIST program, and OECD are continuously stressing the need for national structures, capable of coordinating, planning and encouraging scientific information activities. The future we have outlined, based on close international cooperation, will require the existence of these focal points, which, through effective coordination at the national levels, will be able to implement international cooperation with maximum results.

What I have said up to now, views scientifique information problems as the result of the "information explosion", mainly in the form of documents which are produced at an exponentially growing rate, and in an uncontrolled manner. According to all signs, this growth will continue in the next years, and consequently this is the ordinary way of putting the problem. Assuming this information explosion exists, it is necessary to provide the best means to solve the problems created by it. But now, there is a rather different approach: - would it not be better to tackle the problem at its very beginning? Instead of trying to solve the problems arising from the enormous proliferation and diversification of information, - would it not be better to try to control it at the moment it is produced? In other words: a serious and deep rationalization of primary publications will bring a vital contribution for solving or improving information problems. Of course, I do not claim to be original with this approach, which was formulated some years ago. In a paper by Prof. Bernal, published in "Aslib Proceedings" in 1960[2], he said : "In my opinion, the proper way to organize the whole of scientific communication is to organize it in the first place according to the themes or subjects. Here the librarian or information officer is at an enormous disadvantage because he does not control the output of the material which reaches him and consequently he receives the material already hopelessly mixed up. Such sorting can be done, and I can say so with some assurance because I know that it has been done in one branch of science-crystallography... here, the transfer of information is channelled largely through a single international journal, the Acta Crystallographica, with a certain number of ancillary services, a complete system of reports, a complete system of data collection and presentations, a complete system of index cards for finding information, and a complete directory of all the scientists concerned and their special interests. The field is really systematized so that the only thing that can go wrong with it is that someone may do a spot of research and not tell anyone else that he is doing it - but even that could be checked." I am not a crystallographer, and therefore I do not know whether the situation continues to be favorable or has deteriorated.

But certainly, it has not been, nor is the same, in many other scientific branches, where primary journals, documents, etc. proliferate continuously, making information problems more and more acute. I believe that coordination and systematization of primary publications, again through international cooperation and with the possible consequence of a drastic reduction of their number, offers a very promising field for acting in the future. I do not ignore the great difficulties involved, as there are many different interests and elements to be taken into account. But the goal to be reached is well worthwhile.

1. The cost of online searching is down to $5.00 in the United States, seven years earlier than the predicted date. Will it be one to two dollars by 1985?

ed.

2. Bernarl J.D. Scientific Information and its Users. ASLIB Proceedings: 12:12; December, 1960; p. 432-438.

THE DETERMINING CHARACTERISTICS OF THE TIME-SPACE FRAMEWORK OF OUR ENVIRONMENT AND THE SPECIAL NATURE OF THE INFORMATION THAT WILL BE NEEDED.

Dale B. BAKER

ABSTRACT

Man can control the future if he has the courage to do so. The enrichment of life in the developed countries today is the result of forecasting and the resultant direction of science-based industries. Pollution and similar accompanying evils are symptoms of poor forecasts, or none at all. Recent trends in science research and reporting indicates a greater concern with Man and his place in the environment. A redefinition of growth, material interdependance, greater citizen participation, public accountability and changing technologies will accompany future change. Some major social, economic and political issues will not be affected within the next twenty years but will be improved over the long term. Nevertheless, a revolution in computer communication can be expected in the next decade, and that will be accompanied by philosophical and intellectual changes leading to further improvements of Man's condition.

THE DETERMINING CHARACTERISTICS OF THE TIME-SPACE FRAMEWORK OF OUR ENVIRONMENT AND THE SPECIAL NATURE OF THE INFORMATION THAT WILL BE NEEDED.

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I - INTRODUCTION -

Some 2000 years ago, the Poet, Horace, advised his readers not to look into the Future "lest a worse thing befall ". This was pretty poor advice even to Horace's contemporaries. A bit more foresight would have stood some of the Roman emperors in good stead, although I suppose they knew pretty well that they were likely to be assassinated anyway and there was little comfort in knowing beforehand who would wield the dagger or dish out the poison. Horace's advice might well have been "look constantly into the future or an even worse thing will certainly befall." But, perhaps, that phrase did not sound as good in Latin.

In any case, neither Horace's contemporaries nor the many generations that have followed paid any heed to his aphorism - no piece of advice was ever more universally ignored. Looking into the future has been one of mankind's most persistent addictions.

I must tell you at the start that I have long been a member of the World Future Society (with its headquarters here in Washington, DC) and that I, in general have always been optimistic regarding the future. For example, I am one of the 67% of the "Futurists" who believe that the overall quality of life will be better in the year 2000. Some 20% believe that it will be worse.

One of the most important, long-range forecasts appeared in March 1972. It was issued by the Club of Rome and entitled "The Limits of Growth."[1] This interdisciplinary study used a computer-based model simulating future worldwide trends in population, production, pollution, food consumption, and availability of materials. It foresaw not just eventual stagnation, but a catastrophic collapse of the quality of life within 100 years, as growth overshoots the equilibrium point. This group was convinced that, to avert human disaster, immediate steps should be taken to curb population expansion, industrial growth, and the depletion of non-renewable resources. While the Club of Rome has recently tempered those dire predictions, I have been one of those critics who has urged more faith in technology. I can see that population and production can not grow indefinitely, but I see no limit to technology, to service jobs, to leisure time, to recreation, to raising the quality of our physical and social environment, and to the enjoyment of life.

Also, so you will know where I stand before I start my main comments, it is my general belief that man cannot only forecast the future, but also that he can make it virtually whatever he wishes. Except for wars and famines, present-day research into the future can adequately predict what can be in a 10 to 15 year period with an error of not over 15%. What we need is not so much the power to forecast the future, but the courage to change the future. Things do not just happen ; they are made to happen. Yes, change can be painful!

II - PHILOSOPHICAL CHANGES ANTICIPATED -

In recent years, our science-based industries, investing heavily in research and development, embarked on a business strategy of planned and systematic innovation. The results, as you well know, have greatly enriched man's material existence. More than that, they have altered the traditional patterns of our society and of our way of life. But the challenges that face us now are how best to channel and control change, how best to understand it, manage it, and use it wisely for our progress as purposeful individuals and as an ever loving society. Our nations must have more, not less, of man's quest for valid information and its subsequent practical use. For example, pollution is not necessarily a by-product of a high-energy society. Pollution is a symptom of the technological problems of inefficient energy conversion and excessive waste. However, it is also a symptom of what can happen when poor forecasts, or no forecasts, or in some cases ignored forecasts allow people to adopt courses of action that lead to crushing problems. This tells us that we have not yet applied our science adequately or accurately to its total capacity to serve man's needs and purposes; needs and purposes which are social as well as economic. We must expedite and expand our ability to discriminate and to decide among the increasing number of options that we can plan to achieve.

Quality of life is now a top priority for scientists as well as for humanists. A "total systems" approach has been proposed which requires a new symbiosis of applied knowledge. Here, mathematics and the techniques of the physical and natural sciences will meld with the psychology, sociology, and anthropology of the social sciences. The task will be to conceive, develop, and supply life environment configurations that will be understandable, acceptable, and beneficial to man as a person.

Arnold Toynbee, the late, great historian, in a book entitled "Surviving the Future"[2] says, "Scientific and technological achievements cannot be undone, but at least from now on we could, if we choose, divert our efforts and our energies from science and technology to religion and ethics. We human beings are tragically incompetent and unsuccessful in dealing with ourselves." Toynbee goes on to say, "So far science has shown no signs that it is going to be able to do anything to cure man of his sinfulness and his sense of insecurity, or to avert the painfulness of failure and the dread of death." Toynbee says man's fundamental problem is his human egocentricity. "Man dreams of making this universe a desirable place for himself, with plenty of free time, relaxation, security, and good health and with no hunger or poverty."

But, unfortunately, Toynbee did not read the literature of science and technology in his latter years as so often happens in the case of the elderly.

We have seen through the pages of CHEMICAL ABSTRACTS in recent years that biochemical research has increased at a rate nearly twice that of other aspects of fundamental and applied chemistry. This research deals with all aspects of the chemistry of plant, animal, and human life. BIOLOGICAL ABSTRACTS and INDEX MEDICUS, which deal with the biological and medical aspects of the life sciences, also confirm this growth data. All forecasts indicate that research in these areas is likely to continue to increase exponentially in the future. If I am right in reading the information trends and man's desires, then we are in fact doing as

Toynbee suggests and are acquiring the knowledge and understanding that will help bring man out of his ephemeral self and into greater harmony with himself and his environment -- if we support and pay attention to our futures research, forecasts, and planning, and then make decisions accordingly.

I am not promising that chemical and biological understanding will cure all social ills. But I must point out that we are gaining understanding of the chemical basis and treatment of some mental ills, for example, and we are certain to learn more. As more of the chemistry of people and their behaviour is clarified, I believe we will have clearer minds to deal with morality and ethics, politics and diplomacy, and other non-science essentials of life on earth.

III - GENERAL CHARACTERISTICS OF THE 1980's AND BEYOND -

This Panel I is charged with the responsibility of identifying some features of the environments for information processing, dissemination, and use in the 1980's and beyond. In this part of the discussion I will borrow heavily from Roy C. Amara, President of the Institute for the Future in Menlo Park, California.[3] Amara suggests some important broad, general characteristics of the environment during the coming twenty years. These are divided into two parts; I will first give five that are recognizable features and then five that are unresolved:

a) Recognizable Features -

1. Growth: We will see acceptance of a new concept of growth which will balance social with economic indicators and also incorporate notions of "limits", "recycling", and "quality of life."

This process of redefinition already is well underway with the difficult tradeoffs now being made between growth and employment, growth and inflation, and growth and income redistribution. Ministers of OECD nations are expected to agree this week in Paris on economic strategy and controls designed to moderate expansion in order to avoid boom or bust cycles.

2. Interdependence: There will be a realignment of the roles of raw material suppliers and processors. There will be a preponderance of service industries in the US and in the world at large. Multinational corporations will become increasingly dominant. Interdependence rather than independence will emerge as the more attractive alternative for national policy on energy, materials, food, and so forth.

3. Pluralism: We shall see widespread citizen participation and volunteerism in public and private affairs, together with diversity and individualization of life styles. Affluence, education, and technology are the trio of driving forces that will provide the stimulus and the capability for realizing greater social pluralism.

4. Accountability: There will be increasing institutionalization of activities involving appraisal (e.g. environmentalists and consumerists), assessment (e.g. technology), and accountability (corporate and public). Both public and private institutions are increasingly being required to demonstrate their "social worth" to society by a more complete and open accounting of their activities.

5. Uses of Technology : "Humane" technologies, incorporating qualitative (social) as well as quantitative (technical and economic) inputs, and citizen as well as "expert" opinions

will be developed. As understanding of the social impact of technologies has grown, so has society's collective ability to use such technologies more effectively, while avoiding many unforeseen side effects.

b) Unresolved Issues in the Next Twenty Years -

1. International World Order: There still is no effective world order, system of laws, or accepted code of behaviour for world peacekeeping and conflict resolution. Regional military or economic alliances may ultimately provide the basis for political partnerships, but the promise of an international order based on law - if it is at all realizable - will not be achieved in this period.

2. Distribution of Income and Wealth: We will still have inadequate mechanisms for "equitably" allocating income and wealth among nations of the world. In a world of continuing population growth and shrinking resources, this represents the greatest threat to world stability and international peace -- particularly in the relationship between "haves" and "have-nots".

3. Social and Political Polarizations: There will be increased tensions stemming from growing pluralism within nations and growing interdependence among them. Pluralism inevitably makes governance more difficult; interdependence necessarily exposes the principals to the risks of a dependent relationship.

4. Institutional Renewal: We shall see a continued inability to structure institutions capable of self-renewal and adaptation to changing social needs. Ideally, institutional change should lead, rather than lag behind, social change.

5. Freedom versus Security: Conflicts between the requirements of personal freedom and the demands of collective security will continue. An important question concerns the amount and kinds of personal information about citizens that government may collect and store before threats to personal privacy supersede the requirements for public safety.

Daniel Bell[4], the noted Harvard sociologist, speaks of this new environment as the post-industrial society which will be information oriented. Information and communication will be the key to resolution of these unresolved issues. We will need wise heads to prevail in many walks of life in all nations, and these wise men will need knowledge to feed on. The wise will need improved availability of information, the raw material for knowledge and wisdom.

IV - TECHNOLOGICAL TRENDS AND FUTURE PREDICTIONS FOR THE INFORMATION COMMUNITY -

A revolution in computer communications via networks is forecast for the next ten years. As a matter of fact, this revolution has clearly been underway for five years and is rapidly gaining momentum with the advent of microprocessors, low cost minicomputers, and the marriage of computers with telecommunications. The gaps between now and the 1980's are not in hardware technology, but in the application of technology to users'needs, organizational structures, and economic and marketing factors.

One of the most important studies appearing this year was from Auerbach Associates, Inc., Philadelphia (Technical Note Auer 2325-TN-5) Expert Panel Review Report. This project formulated a set of reasonable time-phased assumptions about future information technology, information organizations and economic factors. Two expert panels, one of technical experts and the other of managers, using a modified Delphi technique, reviewed in two rounds some 41 events concerning information technologies and issues.

Some of the events accorded the highest ratings in the study were:

- Researchers will have access to data bases of actual verified data.
- Acceptable indexes will be generated by machine.
- Paper will be replaced as the primary numeric storage medium by digital media.
- Many data bases will be accessible through a single terminal.
- Citation formats will be standardized.
- Information synthesis and analysis will be available to all researchers.
- Optical character recognition will enable any document to be converted into machine-readable form.
- Machine-readable storage media will be competitive with paper.

Thus, we see a scenario of the world of information processing and transfer in 1980's to consist of the following:

1. Paper will virtually be replaced by microforms as the primary document dissemination medium.

2. Machine-readable records will be transferred electronically between locations at low cost.

3. Personal, interactive terminals will be as common as electric typewriters.

4. Many data bases will be cheaply and easily accessible through a single online terminal.

5. Computerized centralized depository with network of consoles will service various groups of users; authors, editors, referees, information analysts, evaluators, and readers.

6. Comprehensive, international, cross-disciplinary and integrated information/data resources will be accessible to individuals through single access points.

Not all of the experts agreed on the probable timing of all these events. For example, notable differences between the panels suggest that machine-readable storage will not soon be competitive with paper: the probable date was identified as 1985 by the technical panel and 1996 by the managers' panel. Standardization allowing data bases to be merged into a single file by user organizations was seen by the technical panel to be probable in 1993 whereas the management panel saw this occurring much later, i.e., 2080. Researchers having access to validated numeric data was seen as occurring between 1989 to 2003 by the two groups.

V - FUTURE OF SECONDARY SERVICES -

As a professional in the field of abstracting and indexing, secondary or accessing services for the past 30 years, I will attempt in my concluding remarks to translate briefly what all the above can mean regarding the future for those of us involved in ICSU AB type of activities.

I want to classify these conclusions into two categories : (A) Philosophical and Intellectual, and (B) Mechanical and Procedural.

a) Philosophical and Intellectual -

1. The increasing complexity of the problems of society has led to a need for simultaneous information from an ever increasing number of fields - such as from the sciences and humanities, for example. We will recognize that any system of information and knowledge that guides a stable society must be rooted in the human experience of its time and place, and hence, in that sense valid.

2. People will read more selectively. The human talents, if they are to be kept productive, will demand more relevant information about the environment in which they operate; relevant and pertinent information to the problems which confront them; relevant information which is accurate, complete, and effectively communicated; and relevant information on management and administration.

3. Reading patterns are changing - such as the increased use of audiovisual techniques and systems. We will need to match these developments carefully and adapt accordingly to continue to make our accessing services more usable.

4. Interactive on-line search systems are only in early stages; they are in fact in their infancy. I call this Generation I of on-line searching. The present output is seldom pleasing in appearance or in ease of use - as found in use of books or journals. The technology barrier which limits "hands-on use" by most scientists or engineers is a very large and difficult problem. Generation II for on-line searching systems must provide automatically necessary adjustments to cue or lead the user easily to choosing appropriate alternatives, to improved browsing, and to retrieving relevant information.

b) Mechanical and Procedural -

1. The use of computers and graphic devices to repackage information to better meet user requirements is well along. The possible contents of these output packages is unlimited, but much R & D work in this area is needed. Also, the large variety of forms now available for communicating information means we must carefully assess the cost-effectiveness of the techniques and make changes accordingly.

2. The ability to integrate data bases will become a most critical issue by the 1980's. Every effort must be made to develop and promote uniform practices in the transfer of scientific and technical information. The use of our publications and services becomes more economical and less difficult when formats, abbreviations, terminology, and other aspects of similar services are the same or easily translatable. This will require much greater cooperation and compatibility among secondary information services than we have seen or been able to achieve, heretofore.

3. Having whole primary text available in machine-readable form for secondary processing will help in automatic indexing and extracting. Computer-based systems for extracting data (especially numerical data) and indexing with the degree of sophistication needed to satisfy user requirements are yet to be developed. The 1980 environment will bring much greater pressures for deeper indexing, "perfect" analysis, and organization of materials so that retrieval of relevant materials can be accomplished in a "fail-safe" manner.

Our present systems and techniques for manipulating information are powerful and sophisticated when viewed as the culmination of historical development. But they are naive and clumsy when compared with what they can become and what we must make them become if we are to survive and prosper in the 1980's. So welcome, ladies and gentlemen, into the post-industrial age, the "Information Society".

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1. Meadows. D. et al. Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind. Universe Books; New York: 1972; 205 p.

2. Toynbee, Arnold. Surviving the Future. Oxford University Press; London: 1971

3. Amara, Roy C. Some Features of the World of 1994. The Futurist; Vol. 8, No. 3; June, 1974; p. 129-130

4. Bell, Daniel. Welcome to the Post Industrial Society. Physics Today: February, 1976; p. 46-49

DISCUSSION

J.J. LLOYD -

Dale, you have touched on something very serious that I think Don Fink also expressed earlier when he spoke of the coming proliferation of information systems in the social sciences. But in view of your feeling that these things will not be solved within the next twenty years, and the impression I gathered from Don that these things are coming - but we don't know when, isn't it time to get started, and shouldn't we say to someone, "find us the answers to these questions?" Does this give us direction, not as scientists because it is out of our areas - but shouldn't we be doing what we can to encourage the accessing of the decision-making information that these problems will require ? Can we accelerate these developments?

D. FINK -

I think the major problems that Dale identified have got to be solved in the next decade or two, or three. It clearly indicates that we'd better have some mechanism for maintaining the frail balance of civilization in the absence of solutions. We have been depending upon a balance of power between two main political powers, now about to become three or perhaps even four, and it seems to me that the role of social science, which will illuminate the possible ways of maintaining a compromise situation is a long-time proposition. We have to have a mechanism to keep from the abyss in the meantime, and I think that's the reason we should move fast. I don't think there's a minute to be wasted.

L.B. HEILPRIN -

I'm taking a slightly pessimistic view here - I say that Man as a Goal-Seeker is a fact, but that Man as a correct Event Forecaster is not a fact. I want to ask whether this is not the actual situation, that the primary danger of entering an information-oriented society is in seeking uniformity. Things like Nazism for instance, represent uniformity, and Democracy is not necessarily uniform although we are constantly seeing standardization, unification, etc. Everybody has been talking about what is going to happen in the future, how our technological capabilities will become greater and we will have this greater fluidity, this greater back and forth intercommunication feedback situation. Now when you have greater uniformity it can be used to control people, or it can be used for freedom. So, I am asking anybody if they want to comment on this fairly obvious question?

M.G. JONES -

I understand what you are saying - that the medium really is not the message, or maybe you are asking the question, "Is it?" I guess I look at the technology, the hardware standardization as a way of making this network truly global. But in terms of how we use it, what kinds of information go through it, it doesn't seem to me that it has to be uniform or standardized at all. I don't have the same fear you have, as we move toward greater uniformity in terms of standards so that we can truly network, and we can really interconnect with each other. That does not necessarily imply that the content of what is going through this distribution network has to be uniform - or indeed, will be.

D.B. BAKER -

If I may add a comment, I think we've got to get to that stage of symbiosis of knowledge where the scientific and technical information blends with the psychological and anthropological. We have to build these life-style models. Now, when you get to the propaganda or misinformation, explosion, then we have a serious problem. I wanted to touch on this and I didn't know how, and I was pleased to see Ms. Jones raise it this morning about the quality of information. I don't know what we need. Do we need regulatory agencies - a "Good-Housekeeping" seal of approval on information? How can we develop the quality and get rid of the misinformation and propaganda that we are being bombarded with in the news media today? How can we develop the critical evaluative powers that we need among humans to sort out, sift out, to give them the proper data and information they need to make the right decisions? Wise people have to do this, and I don't know how to do it.

M.G. JONES -

I am a great believer in the free market place of ideas. One of the things that troubles me in today's communication is that we seldom have the opportunity to have the ideas clash before the same people at the same time, and so claims and ideas go past each other and we never have a chance to sort them out - indeed, we may not hear them at all. And I guess again, one of my feelings of optimism about the technology that we are on the fringe of, is that it will provide us with an opportunity to be interactive on issues that we can grab hold of. We can in fact pose the issues to each other, or to the people who are providing the information. It makes me a little bit more optimistic about the free market place of ideas as a way of trying to, if not assure quality, at least to give people an opportunity to evaluate quality. Now I am not talking, obviously, in your areas of scientific information. I am talking more in terms of the areas of ideas and propaganda on the kinds of political and social economic information that we get on current issues and problems.

D.B. BAKER -

Ms. Jones is an optimist when she has faith in the checks and balance system of our world order. Now, I am not sure that I have that much faith or that much optimism. She believes that the checks and balances, the freedom of choice that people will have, will allow us to continue in the mode of democratic societies. And I think that is what we are worrying about, is that correct?

L.B. HEILPRIN -

Well, I was thinking that it's possible to evaluate, but not necessarily to be moral, and I consider that when we enter into the world of extreme fluidity, of uniformity, it is possible to use these things in a non-moral way to control people. And simply, not trying to make an issue of it, I am saying this is perhaps the greatest danger that confronts us.

A.A. AINES -

It occurs to me that all three speakers have not talked about one issue - that is, if we are moving toward the post-industrial society, where 50 to 60 percent of the Gross National Product will be involved in the so-called knowledge industry, what is the role of the information worker? Quite obviously they have become a larger community with the passage of time and larger communities have political capabilities as they grow. I think we ought to begin to think as to what the proper role of the information professional is going to be in the next decade.

If we don't ask that question, you can be sure every scientist, every engineer, every politician, every statesman will ask that question. This goes back to that famous speech many years ago that was made by Weinberg, when he talked about the "gate-keeper" and wondered whether or not as a scientist, it would be a wise idea that he maintained some degree of control over information, and not allow it to be only with the province of the information-handler. We are, in fact, a very powerful and dangerous group unless we begin to think of it - as Mary did - in terms of service, in terms of making sure that in our zeal to create the networks of knowledge, we indeed will not become a dangerous community to the rest of the world. Sometimes too much information can be as dangerous as too little information.

I.L. AUERBACH -

First, I acknowledge the extremely stimulating presentations that were made this morning and I thank Dale Baker for citing the work that we have done recently. There is a point that is seriously being threaded through the comments that are being made and some of the questions that are being asked with regard to the optimists of the future and the pessimists of the future and what the futurologists have to say. Being a futurologist, and being of the optimistic school, there is one facet of it that I believe is extremely frightening and Ms. Jones mentioned it on two occasions, and I want to just briefly touch on the one and then come in on another, if I may. We talk about uniformity of information - I just wonder how many of us are aware how uniform the lives in America, and in fact in the Western world have become through mass communications. We become more and more alike and more conforming and less dissimilar as each year goes by and this is a very powerful force and a very frightening one. I think Dale has already raised the question with regard to how do we go about measuring the quality of information that is available to us. Are you proposing a federal

Information Commission that has the same functions as the Federal Trade Commission, to protect us with regard to truth in information, as to what's in our data bases, and how do we go about measuring quality of that information, and what is available, and how it is challenged, and what legal process do you go through in order to correct this information? I think these are very critical issues as you look to the future and quite frankly, they are not technological at all. Technology is a fact, and the computer is an existing device and it's going to severly modify the future, and I think there is little we can do about it in this room or out of this room. I think how we use these devices is extremely critical and that leads me to the second point; at the Club of Rome meeting in Philadelphia this April, a very interesting discussion ensued and an observation was drawn that I would like to repeat. It had to do with this issue of conformity and the way we are going about it, particularly in western societies. As we start to control these data bases and provide uniform information to our citizenry so that they can help to make decisions, we will be moving more and more towards the totalitarian governments. The forecast that they came up with in the informal panel was that by the year 2000, most of the Western democracies will, in fact, be totalitarian governments unless we take very strong and restrictive steps to see to it that a variance in information is available, and if there is a way of providing conflicting points of view to our citizenry. I was wondering if the Panel cares to discuss that.

H.G. JONES -

I don't know where this uniformity of information comes from. I haven't heard it as something that anybody has been promoting, unless it is assumed that if we have data banks, somehow the data banks will be stocked with uniform information - and I don't make that assumption. So that as a concern of mine, it is not a very great one. Maybe I should be concerned with it. I guess, as Mr. Baker said, I am an optimist. I believe that an alert citizenry can protect itself. I don't know whether what we have to do is have the raw data in the information bank and then we look to the normal institutions in our society for taking that raw data and making analyses of it and drawing conclusions from it. Perhaps what we should look to there is to say to the citizens, "You now have the opportunity to go underneath and get the raw data yourself, or on the other hand you don't have to. You can still rely on people who will translate it for you." Maybe this is a way of trying to protect people from being propagandized with information. I don't suppose any of us have really explored - I certainly haven't - the way to protect us from propaganda and untruths. Advertising substantiation ? Information substantiation? Whether these are techniques to try and protect us?. I don't think I can go much further than what Mr. Baker summarized about himself. I really do believe in competition as a source of quality between data banks. I believe in the free market place of ideas, in other words, in the clash that will expose, hopefully, the inadequacies of half-truths. As to the role of government in this, I really have not thought it through - I just haven't gone that far in my thinking.

[illegible] -

I just would add that I quite agree with Mr. Jones. I did not think in terms of uniformity in that sense at all. I am only trying to promote uniform practices in the transfer of information; to make our services usable in combinations. Some people say "standardization" and I didn't want to use that word. I used uniformity in technology and other aspects to make this translatable. I do know that Dr. Auerbach is correct about conformity, I think this trend is going to be with us, there is no question, we can't escape it. The year 2080, a hundred years or so from now, we will have to have conformity to live, to exist in the world of the future, there is no question about that. On the other hand, you can have great individualism in life-styles. We've all had many more rules and regulations that we've had to live by in recent years, but that doesn't preempt from great leisure time, leisure society in use. We will turn that way, I am convinced. You may not think it is going to be a better world, Dr. Auerbach, but when you come back in a hundred years from now - you will say it is a better world. Since we have optimists and pessimists here, and I should think in any normal symposium somebody should be in the middle, I will call myself a Poptimist. That is a pessimistic optimist. There is a good deal of reason to be optimistic about the future and there is a good deal of reason to be pessimistic.

I used to teach history and there was an old adage that by studying the past we can understand the present and perhaps improve the future. That's not so! We have studied the past, we have never understood the present, and we certainly have done nothing to improve the future. If we had, the first time Neolithic man picked up a rock and threw it at another, he would have learned the results of anger and war, and we would never have fought another war. Whether the collection of good information is going to help the citizenry, and I am not now talking about scientific information but about social science information, whether it is really going to help us make life better, I would say "Yes, I agree". Historically life has continued to become better, but I should also point out that every improvement in technology which has had anything to do with the storing, dissemination or improvement of information, has brought with it concommitant dangers. Totalitarianism of the kind that one found in Nazi Germany or in the totalitarian governments in the world today, could not be supported without the technology for collecting information and the technology for propaganda - that is, in communications technology. So I am pessimistic, in a sense, that all of this that we talk about in terms of the good we can do with information, has behind it the elements of causing a great deal of harm. In particular, because as much as I am a believer in democracy and a believer in the real strength of the common man, we don't always know how to use the information that we have. Thus, I think we should all be Poptimists.

END OF PANEL I

PANEL II

THE NEW MEDIA, TECHNIQUES AND MECHANISMS REQUIRED FOR THE 1980's.

Moderator : *J.R. SMITH. BIOSIS*

Indeed, what is there that does not appear
marvellous when it comes to our knowledge
for the first time?

Pliny the Elder

THE INFORMATION INDUSTRY
AN INVISIBLE INDUSTRY

Isaac L. AUERBACH

ABSTRACT

Changes wrought by the Industrial Revolution on our agriculture, industry and general way of life are visible phenomena on our urban and rural scenes. They stand in high contrast with the social landscape of the past. The Gutenberg revolution was equally visible as it produced an age of print. The advent of the electronic computer, which has taken a greater step in changing our environment, is virtually invisible. Secondary clues are evident in television and in hand-held calculators, but it is more difficult to convey the significance of this revolution to the man in the street. The information industry, which is potentially the dominant force in the world today, shares this invisibility. It is incumbent on the industry itself to impress an information consciousness on the community. If the computer is to provide it's full capability for societal good, it must have the service of trained and perceptive people to develop it's power, and that pool of human resource is related directly to the public awareness of the computer revolution and it's world potential.

THE INFORMATION INDUSTRY
AN INVISIBLE INDUSTRY

Isaac L. AUERBACH

President Auerbach Corporation for
Science and Technology
PHILADELPHIA, USA.

1. For over 25 years, I have been presenting papers to professional organizations on the impact of the electronic computer on society, and how it will change our cultural and societal values.

Thanks to Ralph Lee Smith's concept of the "wired city" and to Harding Vowles's writings, I have acquired a new perspective and insight into one of the difficulties that we, the architects of the information revolution, have in developing greater awareness of the current and potential impact of the information revolution on mankind.

With clear hindsight vision (an historical view), the industrial revolution revealed its true character and impact by making dramatic and highly visible changes in our environment and our landscape. A short plane flight reveals ribbons of concrete that crisscross the countryside in bold contrast to the natural environment. Air travel itself has dramatically altered our perspective of time and space and the size of the earth ship on which we ride. This totally different perspective of time has dramatically altered our way of life.

Another view of the industrial revolution is its impact on agriculture, once the dominant driving force of man's labors. It was the focal point of the structure of our society and the major consumer of man's time and effort. The tractor has made the horse vanish from the farm. Agriculture today has become an appendage of the industrial revolution and the city. It consumes a mere fraction of the manpower it once did.

Each of these in its own way stands out in high contrast to our past, and is easily discernible. Even though understanding of the impact of the industrial revolution varies greatly, everyone was conscious of these changes because they stood out in bold contrast to the old familiar setting.

2. The information industry is a different story. It started out being highly visible as the graphic arts industry. The Gutenberg Press was one of the major inventions of man that made information a more widely accessible commodity and was one of the first driving forces of the information revolution. It is interesting to note that during the Middle Ages, just before the invention of the Gutenberg Press, a highly educated man's library (such as Chaucer's) might consist of 20 books. These he re-read and studied intensely. Today a college student could easily amass 500 paperback books in his personal library.

   The age of print, the storing and communicating of information, was graphic, visible, accessible, and had a vibrant presence to our sense of sight. Print was the medium by which the past was preserved, the present operated, and the future planned. The medium was clearly perceived and was the message even then.

3. With the advent of the electronic computer the information industry has taken a more gigantic step in changing our environment. Vowles triggers an interesting analogy:

   - "If handwriting was the nomadic tent of the information industry's beginning, then
     - handset type is its country cottage
     - mechanized typesetter its townhouse
     - photo-lithography its low-rise apartment dwellings and factories, and
     - the computer, the structural steel of the information age revolution.

   - The computer makes possible the information skyscraper and long-span bridges of information processing and communications.

   - Just as structural steel wrote a new, highly visible chapter in man's age-long struggle with gravity, the computer is writing a new and huge, but excessively invisible, chapter in man's age-long struggle with limits or time and man's unique intellectual capabilities."

   Let me put in juxtaposition: the industrial vs the information revolution. Each of the steps in the industrial revolution was conveyed by highly visible messages to the world's population that significant changes were taking place, be they

   1. highways
   2. the huge motorized ocean vessel
   3. the long-span bridge
   4. the emergence of the skyscraper
   5. the airplane.

In contrast, the information revolution, and in particular the computer and electronic devices, do not provide such visibility. We are left with only secondary clues such as:

- punch cards
- television, and
- hand-held calculators.

This lack of visibility has made the information revolution much more difficult to convey to the average man on the street. The information skyscraper is right in our midst but we cannot see it. The information long-span bridge is constantly connecting the information skyscrapers, but we are not aware of it. The information transport system with its load-carrying trucks, trains and vessels invisibly transporting huge cargoes of information around the world in microseconds is all but oblivious to us. And yet, it is doing more to change society and eventually our whole cultural structure than any force in this modern age.

4. The information industry is potentially the most dominant economic and social and cultural phenomenon in the world today, and yet it is predominantly invisible. As computers and networks of computers proliferate and invade every facet of our daily lives, there seems to be little awareness by the general population of their immense impact and significance. These changes can introduce unprecedented stresses into society which could have wild misunderstandings.

   What is most unfortunate is that because of the low visibility of the industry it does not stimulate the development of the many people who will be needed to assist the communities in achieving orderly adaptations and to prepare our society for the dramatic changes in their social or cultural lives. This invisible industry will potentially annihilate accepted meanings and accepted conventions, without providing the education or assistance that will be necessary to create an aware population to ease the transition as existing institutions revolutionize themselves to survive and contribute to a new social context.

I believe it is incumbent on all of us who are familiar with the information industry and its implications to do all within our power to assist in awakening an information consciousness about the current and future impact of the information revolution on our lives.

5. Recently, we prepared a proposal for the National Academy of Sciences to the National Science Foundation to awaken the information consciousness of the executives and managers of government, industry and educational institutions. For the past 20 years, I have personally been identified with the need to increase the public's awareness of the information industry, its presence, its characteristics, and the future that it bodes. The task is never ending.

   The computer will generate a need for more perceptive people who can do the things that most people cannot do. The only real limit to the development of the automated computerized systems is the shortage of people who can comprehend them, develop them, change them, and anticipate the consequences of their operations. As the computer becomes more competent, these people become scarcer.

   The community's ability to generate such people will relate directly to the level of awareness the people of the community have of the information industry. We may be deceived by the ease with which we can train technicians to do specialized tasks required by computers and distributed processing networks. What is also needed are people who understand these new systems and how they can be applied to the full spectrum of the community's activities, each of which will be affected. The future of the information industry and in turn of society depends to a great extent on our ability to communicate the presence, nature and understanding of this invisible industry to the community at large.

6. As the technologies of computers, automata and networks evolve and are refined, they will reveal that the present concept of the western city is obsolete socially and economically. It is being replaced by a more economic, more profitable, and more humane physical environment in which people can fulfill their lives less arduously and more completely.

   With the exponential increase in telephone service throughout the country and the explosive growth in cable TV, major cities will permit employees to communicate directly with their businesses, without ever reporting to the office. This will significantly alter the need for transportation, office space and other amenities necessary for most white collar employees.

   For example, in East St. Louis, Illinois, a major computer composition company has only 5 people in the office out of a total of over 70 employees. The remainder have typewriters at home that are interconnected via telephone line to a central computer. A courier delivers manuscripts to the employees' homes and they do their jobs at their convenience during the day, being paid on a per-keystroke basis with errors deducted to ensure a high premium on accuracy.

It is certainly within our capability to conduct many businesses remotely within a few years.

Many questions are asked as to how the needed visibility of the information industry is to be achieved. What new approaches might the information industry undertake to be perceived as itself rather than as an appendage to the resource-hungry mechanical dinosaurs of the industrial revolution. These and other questions need to be answered so that the infra-structure of our society can be ready to cope with the changes coming along and not be their prisoner.

Each of us, you and I, and all the rest of us who are knowledgeable and engaged in the information industry have an obligation above and beyond the perfection of the means and the media and the mechanisms for disseminating information to ensure that all of the remaining people with whom we come in contact, and those with whom they come in contact, become more aware of the implications of our efforts. In closing, it is critical that each of us dedicate ourselves to increasing the awareness of an information consciousness so that the positive attributes of our efforts are amplified and the negative attributes diminished.

SHALL WE BE READY IN THE 1980's?

Nathalie DUSOULIER

ABSTRACT

The publication explosion may be offset by the inflation of worthless as well as significant scientific papers so that the winnowing of the former may affect the real quantity of the information explosion. The search for publication alternatives at the primary level has been accompanied by the automation of most of the secondary services. But the user's reading capacity is limited and all of these circumstances have led to uneasiness at all levels. The increase of journals and new hardware developments have created economic problems. Other questions are evident: will the large monolithic services be able to cope with diversified needs? How will secondary services be affected by many of the primary alternatives? When will repackaging become a reality? How are language problems to be solved? These are some of the questions that must be answered as we move into the 80's. The problem of document delivery is also great and cooperation with the libraries is essential to its solution. All of this indicates that we must not allow ourselves to be carried away by dreams of push-button services in the near future.

SHALL WE BE READY IN THE 1980's?

Nathalie DUSOULIER

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The task assigned to the speakers in this second part seemed a particularly difficult one inasmuch as when we wrote these papers we had no idea of the future which would be offered us by the eminent speakers who have preceded us.

One solution would be to take a philosophic approach and deal with theoretical ideas on what scientific and technical information services could become in the five or ten coming years, so as to satisfy their users, keep up with technology and solve economic problems. The other solution woul'd be the pragmatic approach including some practical suggestions.

Fearing my inability to master all socio-economic and politico-humanistic problems I decided to keep to the technico-scientific path.

In order to propose clearly a certain number of solutions for the future, it is necessary to sum-up what information services have become within the last ten years. Using Wersig's classification[2] we can consider that information process and systems' components are:

- Communicators (authors)
- Recipients (users)
- Mediators (libraries, information services)
- Mediation technology (computers)
- Messages (documents)

Development of these stages has been uneven but these differences oblige us to face up to them and try to reap their benefits rather than to submit to them. What are these developments?

At the production level it is obvious that there is a regular increase in the number of publications, even if there are numerous controversies as to the real value of this increase. Taking the lowest figures put forward by G. Anderla for 1985-1987 we arrive at an estimated fourfold increase of the number of documents produced in 1970. It must be pointed out, however, that it is very difficult to measure this inflation in terms of real quantity of published information since the number of worthless scientific and technical documents also show a marked increase.

This situation at the production level has induced journals to make an effort in finding new kinds of presentation which help the reader in quicker scanning of the literature and to find less but more specific information.

It is obvious that the users' reading power is not unlimited and the fact that each year there are more and more specialized scientists and engineers is not sufficient to compensate for the growth of the literature.

Concerning mediators, in 1976 we can evaluate the production of the main citation-based services at three million items. Should G.Anderla's predictions come true, then in 1985-1987, we should arrive at twelve to fourteen million items.

In spite of certain differences,due to historical, cultural or economic causes, the activities and products of these services are of a kind, although it is usual to distinguish between discipline based (scientific or engineering) mission oriented and crisis-generated (space, energy). In fact all existing services try, as far as possible, to have all these functions.

Most of the large services are automated and many are partially or completely equipped for on-line searching from remote terminals by a wide variety of users. On the technology plane there is an appreciable development in storage possibilities (increase in the number of documents requires more compact physical storage for them) and in communication networks whose implantation in the United States now extends throughout the world. Traditional printing procedures are questioned, as new techniques for document logging and search oblige producers to distribute them in different forms such as microcard, microfiche, magnetic tape.

We could therefore be more or less satisfied with this state of affairs and wait on the future without reacting. There is, nevertheless, very real uneasiness at all levels.

The increase in the literature without increase in the number of readers raises economic problems for producers; development in hardware obliges information processors to redesign systems and management is troubled by the evolution of users' needs, needs which the various services try to satisfy without really knowing what they are. Solutions have been sought in cooperative efforts so as to try and control duplication which, paradoxically, continues to increase. These efforts are not very satisfactory and other means are being sought.

Several large, rather monolithic systems have acquired preponderance in their field but will they be able to extend their ramifications indefinitely in view of the increased diversification of needs?

According to Slamecka, the influence of the increasing expenditures in education, research and development, knowledge resources, and other sectors should extend information needs. But it is not so much a question of quantitative increase as that of qualitative diversification. It is clear that the future provision of information and knowledge resources will require more elaborate and sophisticated means, whereas the increase in literature and the fact that users would like to have personal access to services should result in simplifying procedures.

Before dealing with changes at the system level we should define certain clear options. As always when talking of the future we must be wary, but they can be a basis for discussion. We could imagine the following situations:

At the production level, the need for selection and the almost absolute obligation to use new technologies will force publishers to circulate printed literature in a personalized current of documents to individual subscribers. They will assume responsibility and management, at source, of selective information dissemination services for the information they produce.

What will be the attitude of secondary services to this and what kind of cooperation can be expected? Can the increased participation of scientists in information processing be envisaged and in what form?

Is the only solution to restrictions proper to the technical societies on the horizon, cooperation between large systems for the production of a gigantic, easily accessed and used data-base, and the sophisticated, but very personalized systems based on these huge files? These communities seem to wish for a unique entry point which would relate them to all fields of knowledge.

Will we continue paying lip-service to the concept of re-packaging or will we get down to doing something to establish conditions for its realization?

Will all types of information and knowledge really be processed and generated by the complex networks of information processing facilities and algorithms of essentially the same kind as we now process?

How will language problems be solved? At present English is the main information carrier in many fields and is thus the language of the major part of the documents referenced by the data bases. This is by no means a negligible problem, since it is self-renewing as many scientists are led to publish their papers not only in their mother tongue but also in the working language of their field - or in that of the journal in which they seek to publish.

This state of affairs, however, is not stable and if we replace the language problem in its world wide context we perceive the outline of a number of elements, some of which are already foreseeable

- technological awakening of developing countries
- opening of certain frontiers to scientific exchange
- development of linguistic policies.

Should we face-up to these facts or ignore them?

The economics of information systems will be one of our major worries ; what should be done in order to arrive at a realistic and lasting state of affairs?

All these questions give us an idea of the kind of criteria we must have in mind when preparing to face the 1980's.

Let us now try and see how we can set about solving these problems.

On the level of information production, stronger links must be developed with producers, whether authors or publishers. Carefully written rules rather than vague guidelines would help publishers to encourage their authors to write abstracts usable by both secondary services and journals. Projects such as those carried out by the University of Reading under sponsorship of the British Library and Institut für Dokumentationswesen should be continued and extended to other fields.

Questions of form and style should also be taken up in order to solve problems in the automatic translation of abstracts.

Insofar as publishers will make more and more use of the new technologies, abstracts in machine-readable form should be usable as such by secondary services, which would effect a great saving in time and money.

So we see that close cooperation between primary and secondary producers should not be limited to matters of style and intellectual content but must tackle such problems as formats, data tagging and flagging, interface, etc.

Studies on document identification numbers as part of the abstract would allow easy and rapid access to the original whether in conventional published form or stored in a depository (for synopsis journals)[3]

Cooperation between libraries and abstracting and indexing services must be increased.

For some years now in the United States, Canada and, more and more, in Europe, libraries are changing from a passive interpretation of their activities (depository role) to an active one. They have to face changes in the form and contents of their holdings, increase of documents and help in selection.

More and more acquisition lists are being automated. They act as intermediaries with data bases, and furnish information in SDI form so that differences between the work of libraries and that of information services are being reduced.

If at the level of abstracting, indexing, highly specific retrospective search or syntheses, there is no work duplication with abstracting and indexing services, at the level of acquisition, collection, registration, organization and, partially, search and dissemination of references, there is a need to develop relations in order to avoid such duplication.

Furthermore the establishment of networks and access to many sources of documents can only give the user improved services if he can have easy and rapid consultation of the original document. We cannot go on indefinitely duplicating holdings even when they are in an easy storage medium as microforms.

Cooperation between libraries and between libraries and information services is an essential condition in seeking to solve these problems but here again document identification is vital and the elaboration of simple and precise common rules, facilitating rapid localisation, identification and communication of the original, is an urgent problem requiring solution.

If this is to be our future way then cooperation and work-sharing amongst abstracting and indexing services is obviously the field in which the strictest rules must be developed.

Within ICSU AB our studies have been along these lines for several years but we are still on basic work.

Amongst the three million items quoted above, who does what?

The first stage, which is almost finished, was the compiling of a coherent list of those journal titles covered by ICSU AB members. Here again major problems were those of identification.

The second stage should find out who scans which journal but this leads us straight on to the third stage; what do we mean by "scan"? In theory, abstract papers in the field covered by the service. But "field covered" is a vague term which it is difficult to define even in the fields of pure science. Recent studies in the field of Physics enabled us to pin-point such difficulties. What then can we say for services based on a field of interest common to a variety of users, (environment, oceanography, space, energy)? Nevertheless we must work out acceptable procedures.

Once we have done all this and work has been shared, we come up against problems of control. How can we be sure that the information has been received and processed by those who have agreed to do it?

This work-sharing obviously presupposes criteria to judge the effective, coherent feeding into a common base.

Compatibility of working procedures have yet to be defined. These problems are similar to general problems of the standardisation proper to systems interconnexion and to problems of form (easier to solve) rather than to those of content.

The necessary changes in the contents of the information to be furnished the user is a much weightier matter.

What will be the changes in the information furnished to users by the large data bases: references, abstracts, indexing, classification? Does this information meet the users' requirements?

As we saw above in matters concerning references, present work on standards should settle problems of document identification and access, if these recommendations are accepted and implemented by everyone. But when we come to matters of intellectual content, choices become much more difficult.

If we accept authors' abstracts as they stand it will be difficult to introduce the tagging and flagging necessary to extract, from the bibliographic system, the numeric data they contain. Where user needs in data banks are concerned we cannot go on ignoring the problem, leaving it in the hands of a few scientists who try to solve it by themselves because the large systems have not done so. It is obvious that data banks are becoming essential instruments of research; already scientists consider them as research tools rather than documentation. Processing methods are closer to mathematical techniques than to documentary search procedures. Are they a sophisticated version of information services? Are they the ideal solution, providing they replace the document by appropriate quantitative expressions, documentary languages by the language of science, and the processing of documentation by discovery procedures? If so then we must be prepared for it.

This point leads us straight to document description by means of formalised language.

At the moment there are two fundamentally different approaches:

- systems which use documentary languages and thesauri for indexing and search,
- systems which use natural language for search and automatic or semi-automatic indexing for entry.

If the search software is sophisticated the second way is acceptable so long as it is possible to work properly in a multilingual context. This last is much easier because of the possibility of translation of simple documentary languages.

On-line use of services does not simplify matters.

On the one hand user needs are turned towards better quality in the information furnished, they require exhaustivity, but also maximum relevance which can only be obtained by sophisticated systems and languages. On the other hand direct access to systems by the user requires simplification of access procedures. To satisfy these different approaches we have yet to find a means.

It should be pointed out that in spite of what certain "magnates" of information may say, on-line systems do not eliminate the barriers between the user and the system. On the contrary, they tend to create them and estrange the user. Why is this so ? Rather than one or two data bases, the user disposes of ten-fifteen-forty different bases having different access procedures, multiple passwords and heterogeneous search languages. Knowing one data base is already a complicated affair so that using a terminal to switch back and forth amongst forty bases in order to obtain as much information as possible is hardly practicable. If we cannot have optimum use of the system then we spoil the network tool, therefore a high degree of specialisation is required which the user has neither the time nor the wish to acquire. What are the solutions?

At present there are more and more intermediaries who either train the user or use the systems for him. Small groups are growing up who develop flexible repackaging techniques for drawing from the systems the information required by their clients: the information brokers.

If there is still a choice for developed countries, the problem is much more critical for developing countries because of the lack of competent personnel. Such personnel must be supplied with the necessary tools so that they can nevertheless have access to the systems. Here again we come up against problems of language already mentioned.

So far we have mainly tackled matters of the contents of the information furnished by the large systems, but the form, the technology also evolves and this final aspect may raise problems according to our ability in comprehending them .

One characteristic which we must not neglect is the influence of more compact physical storage of information.

We now have microfilm on crystal which could be applied in computers and which would store information in visual rather than digital form. A computer could thus contain a whole library and instantaneously restore the pages of a book or any other information, which means that secondary information apart from primary becomes unnecessary. We must also be attentive to holographic techniques and videodiscs, and when will we start receiving video-journals on our TV screens for indexing and abstracting purposes?

Computer/micrographics link-up should also concern us. Direct transfer magnetic tape → micrographics is already well known and much employed (COM). On the other hand, micrographics/computer memory link-up, which extend techniques of optical reading to the physical support of characters to be read, to films and microfilms, will probably open up new possibilities mainly in publishing and automatic composition.

We must also take into account automatic or semi-automatic information search on micrographics as this would allow our publications on micro-support a new lease of life and also permit access to information in interactive mode. The original document can be found and displayed in less than ten seconds.

Are we capable of associating such tools with our data base systems so as to help in furnishing the original documents stored on microforms?

Rather than technical problems, we will have to resolve problems of organisation, cooperation with publishers and other information producers, adapt to new technology and draw from these new structures, services better adapted to the needs of users. These require such flexibility and such rigour as to seem a high risk in the future. Let us hope that we will come out winners.

All these matters which we have dealt with leads to the conclusion that it is urgent to discover the mechanisms necessary to furnish the user with the information he requires, for if the user is often described as someone completely overwhelmed by the literature flood and quite incapable of extricating himself without our help, he may, if driven to it, show us he is quite able and competent to find his way through the mazes of scientific communication by using his own selection mechanisms.

There are certain dangers we must, however, avoid and particularly:

- letting ourselves be carried away by dreams of push-button documentary services or go to the opposite extreme,
- showing exaggerated preference for more realistic projects which would, become out-dated before their time.

In spite of what I have just said, I still think it is dangerous to attach too much importance to user studies. The user prefers gradual change in the documentary habits he contracted during his years of training and he would be suspicious of changes which did not coincide with changes in his requirements.

1. Wersig, G. Terminology of Documentation: 1200 Terms in English, French, German, Russian and Spanish. Unesco: Department of Documentation, Libraries and Archives, 1976. 274 p.

2. Anderla, Georges. Information in 1985: A Forecasting Study of Information Needs and Resources. Organization for Economic Cooperation and Development, Paris, 1973, 130 p.

3. In an effort to control the unlicensed photo-copying of journal articles, in compliance with the 1976 U.S. Copyright Law, a growing group of serial publishers have combined to create the Copyright Clearance Center, Inc. Each of the participating publishers is displaying a unique number in print assigned to every article appearing in their journals. The number, which is related to the ISSN, is the code used by readers in addressing requests for photocopies to the Center. This, if extended, could be the nucleus of universally assigned "document identification numbers."

   The operation of the system and the Copyright Clearance Center is described in detail by Ben Weil in Information Reports and Bibliographies, New York, Vol. 6, No. 4. 1977.

Ed.

INFORMATION TECHNIQUES AND MECHANISMS FOR THE 1980's.

Derek H. BARLOW

ABSTRACT

The incubation period of innovative products has varied from two to fifty-six years with the median close to thirty for the elapsed time between conception and acceptance in the mass market. The conclusion to be drawn is that "Innovation takes longer than we think." In 1960, SDI was hailed as a great breakthrough and we now see it being replaced by online service. There are few visible innovations that will add a dimension to the information picture of the 80's. The present aim should be a reduction of the cost of existing techniques and a decision on which of the available ones to support. Economic pressures are mounting, literature continues to grow, production costs are increasing, and markets are changing. The future will see little rapid change, but a consolidation and more information analysis. Decision data will be linked to subject data bases and the importance of numerical data bases will rise as bibliographic data declines. The abstracting and indexing services will diversify into new fields, and they will not be monolithic.

INFORMATION TECHNIQUES AND MECHANISMS FOR THE 1980's.

Derek H. BARLOW

Director, INSPEC.
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Having heard Dale Baker's review of the technical future followed so ably by Nathalie Dusoulier's view of European events I am in a difficult position of trying to locate a new approach on which to present my theme. However, I think the best thing is to take a pragmatic view and say while all the changes are possible and will happen, what is the time scale on which they will occur? How long do things take to change?

We are talking of the 1980's - how will techniques and mechanisms change? What will be in wide use then? Will we see individual terminal systems for everyone providing information from supermarket price lists through to the daily paper made up to your own format with a little bit of technical information thrown in? It's all possible, it's all perfectly feasible now, but how far will it have got in another 4-14 years.

Is change crowding us in? Is too much happening too fast or are we being conned by a journalistic premise of future shock stating that the pace of change has accelerated, discomforting everyone. This premise needs examining.

Let us look at the pace of change and see what are the gestation periods for new inventions. If change was accelerating then the recent innovations should have shorter gestation periods. An examination of a few of these will show this point to be invalid, the field is immaterial, the principle should hold for any innovation, whether it be trivial, important, private or public, and would also be independent of use or discipline.

Also appearing in the New York Times was a list drawn up by Steven Rosen which reviewed the period that lay between the conception date and the realization of the innovation in a mass market. The list is given below:

Innovation	Conception	Realization (mass Market)	Incubation period (years)
Antibiotics	1910	1940	30
Auto-transmission	1930	1946	16
Ball point pen	1938	1945	7
Frozen foods	1908	1923	15
Helicopter	1904	1941	37
Gyrocompass	1852	1908	56
Instant camera	1945	1947	2
Magnetic recordings	1900	1937	37
Nuclear energy	1919	1965	46
Radar	1904	1939	35
Radio	1890	1914	24
Telegraph	1820	1837	15
Transistors	1940	1956	16
Video recording	1950	1956	6
Xerox	1935	1950	15

So while we might argue with some of the details of this list the general theme is fairly clear - things take a long time to be really accepted as part of our way of life. In fact, there is a law which can be briefly stated that "innovation takes longer than we expect". One might also apply this approach to the information handling scene. What has been the success rate or the innovation practice there? In 1969 one saw the massive computerisation by the abstracting and indexing services - that's only 7 years ago and not all of them are completely computerised yet. So again this is taking the natural length of innovation period.

Also in the 1960's, in 1961, we saw the SDI concept hailed as the saviour of the information problem where everybody would receive their individual information just matching their requirement. This has not been the success that everybody portrayed and is being rapidly overtaken by on-line.

Also in 1966 we saw the first struggling attempt at an on-line system. Now ten years later this one looks as though it will really make it.

But in trying to look forward to the 1980's, are there any new techniques on the horizon that will add a totally new dimension to the information scene in the 1980's? I suggest that there are very few and that we already have all the techniques we need. What we require now is the economic stimulus to reduce the cost of these techniques so that they can be applied. The problem that will face the information system designer will be to know which of the many tools available he should back and which are the ones that will be technically and economically successful that he can base his system design on. The list is large and Dale has added to those that I already had. Putting them together they are:

- Associated memories
- The role of the mini-computer versus the main frame
- The choice of terminal points
- New retrieval techniques
- Automatic indexing
- Automatic translation

- Data compression
- Machine indexing
- Availability of better OCR techniques
- Standardisation of citation format
- Access of data itself

All these and more conspire to make the designer's choice more difficult and it is interesting to note in Dale's talk the results of the Delphi study in which the scientific and management teams reviewed the dates on which certain techniques should come in. E.g., machine readable storage, according to the technicians, would be competitive to the price of paper storage by 1985. Management took a more pessimistic view and quoted 1996. This gives an introduction span of 9-20 years. Similarly, in the standardisation of citation references the technical team reckoned this would be complete by 1993, while the management thought the date would be 2030, a span of 20-30 years. Numerical data - the span was 13-27 years. But whatever the actual results may be the span lies convincingly close to those of all other innovations. In fact, are there any golden opportunities for A & I services? I feel that there are now very few golden opportunities today waiting to be seized; rather the abstracting and indexing services are having to respond to the challenges and pressures imposed upon them by adverse economics now affecting both producting and marketing operations. The problems that services face are economic pressures, technological change, the growth of literature and the changing markets. Studies conducted by the Indiana University Graduate Library School[1] show that subscriptions to the secondary publications field in the special library area are declining: in some cases quite rapidly. Production costs have increased dramatically; in the UK scientists' salaries have increased by 85% in the last six years. Paper has gone up 128% between 1973 and 1976 and distribution costs have risen a dramatic 200% in the same period.

Literature growth is another problem facing the A & I services. Numerous estimates have been made and everyone has their own choice of the figures they wish to see. Some of the latest figures given in the Statistical Indicators for Scientific and Technical Information Communication prepared for the National Science Foundation[2] indicate a compound rate of 3% per year. Other figures given by Anderla of the European Communities suggest that this is four times higher. But whatever the figure, this is a direct increase of production cost that has to be absorbed by the A & I services.

Technology change is the other change. There will be changes both in the delivery mechanism and in the mechanical/computing processing systems used by A & I services. On the delivery mechanism, on-line access presents the greatest challenge. The projections of the European EURONET system planning to start with 700 terminals late in 1977 indicates an expected market of over $ 6,000,000. But what is not known is whether this is all new business or if it is a switch in markets from traditional publications to the on-line. As yet no-one knows.

So the big question facing all A & I services is how and when this switch in markets from traditional publication to on-line will occur, because one cannot imagine that there will be a totally new market of this magnitude just coming into being. To handle this change will tax all the management and marketing skills that the A & I services have.

Also on the technological side are the new approaches such as the Viewdata system being developed by the British Post Office. This is the new interactive information service designed to serve the general public as well as the business community. It provides for on-line access to data-bases of useful information via an adapted domestic TV receiver. The system is simple to use and a numeric hand held key pad selects the information to be displayed. One of the attractions is that the display can be in 7 colours, it is interactive and limited graphic facilities are available, and the databases that are being planned in addition to the scientific and business news are hobbies and pastimes, education, houses and mortgages and jobs and careers. So that here is a new technique which has simplicity of operation, unlimited database capacity and ease of expansion.

So one can possibly see the techniques and mechanisms for the future looking rather like this:

- Very little rapid change, instead it will be a period of consolidation and analysis. The information that we have is overwhelming us, what will be required is more analysis. Already a start has been made in this area by one database producer who is reviewing all the items processed in his database against the criteria of whether the article contains any innovation. Viewed in the light of technological change and technology transfer, this adds a new dimension to the material.

- There will also be a phase of linking decision data to existing databases. This is happening in areas where the business data is included in the database and projection techniques are now being included as part of the retrieval packages.

- There will be less emphasis on bibliographic information in the R & D field and more emphasis on commercial and economic data.

- There could well be a closer linking of engineering design systems for mechanical engineers, chemical engineers and electronics engineers with product banks and with vendor data.

- There will be a greater diversification by the A & I services into new fields. They must find new areas and develop and not be monolithic.

- There will be new changes in the document delivery process.
- There will be more usage of photocomposition.
- There will be more communal activities and obviously more on-line.

It is instructive to look back sometimes and I would recommend to any member of the audience to review the papers published by the Royal Society following their information meeting in 1948. Very little that has been said here was not said then. Information in the post-industrial society is where industry was some years ago, facing a period of rapid growth and automation. Changes are occurring but the rate of realisation and implementation of these changes will be long. The impact of the change is here : we have heard what it is and what I am trying to do is to put a time scale on how long these changes will take. There is a saying "Wake up, it is later than you think." My guess is that we will have to wake up now if we are to see these changes implemented by the 13 years that we have left.

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1. Fry, Bernard M. and White, Herbert S. Economics and Interaction of the Publisher-Library Relationship in the Production and Use of Scholarly and Research Journals. Graduate Library School, Indiana University; Bloomington; 1975; 417.

2. King, D.W. Indicators of Scientific and Technical Communication: 1960-1980. Division of Science Information, National Science Foundation; Washington, D.C.; 1976; 99 p.

DISCUSSION

A.K. KENT -

I was interested in the first part of Dr. Auerbach's presentation when he was helping us with the various subdivisions of activities which are put together and upon which the information industry relies for lots of things that it has to do. And it occurred to me that sometimes when one thinks about this there seems that in any of the services, I think about as secondary information,there are two types of resources; physical and intellectual, and this seems to fit fairly well into the packet you were describing. Throughout the discussions this afternoon, there were tones of the problems of economics. They weren't specifically referred to, but there were suggestions that the pace at which things moved is controlled by the amount of money that is available and warnings of the dangers of doing things now because they may not be the sorts of things that one wants to do a little way along the line. Almost inevitably, when thinking of this kind of economics, one gets into concepts of resource sharing and thinking of how it best develops, and it was in that area that I would have gone back to this distinction between the physical resources and the intellectual resources and the consideration of those two in terms of the economies one could effect as one moves forward. Does that fit reasonably well with what you were saying?

I.L. AUERBACH -

Yes, the physical resources basically are in the computing group and that has to do with the ability to store vast quantities of information in hierarchical memories and accessing them via satellite or other communication techniques. The intellectual content is truly information and that is not the activity of either the computer or computing group.

K. HEUMANN -

Derek, I think I would put you with the 32% of the pessimists in Dale's group because I recall something, a talk given I think around 1898 in the older part of this building, where a famous physicist said, "we now have discovered everything in physics and all we need to do is to get the hundredth decimal place". About 18 months later Roentgen discovered X-rays and turned physics upside-down. So I am more optimistic that new discoveries can come along at any time and I think of this as an open-ended system which probably is the best way to plan.

D.H. BARLOW -

I don't want to give the impression that I am a pessimist, that I don't believe in innovation, I certainly do. But I think it has a natural cycle and if there is something that turns things upside-down, it will find its role in that list that I gave you. There were many innovations that are taking 14 to 16 years to go from the idea to mass production. Things that turn things upside-down were the ballpoint pen, the instant camera, which came through innovation to mass production in very short times: 2 years, 7 years, and so on. Don't let me give you the impression that all innovations will take 16 to 20 years.

I think one of the reasons why innovations may take longer is that there is always, as a new innovation comes in, a counter improvement in the old technique. I was trying to think of an example but I am sure all of you will probably know of examples. But if some new innovation comes in you will find that the existing technique price is dropped. It reacted to the competition.

D. FINK -

I'd like to pursue this matter with Derek because there are many times during the period from the first concept to mass production when, if there isn't a lot of risk-taking faith, the whole effort could stumble and it could be delayed 10 or 15 years. I would like to strongly urge that in our field, which has not been famous for flirting with risks, that we must. Even though some of the innovations that appear important for us to have, may flounder and we may find that the old methods can be found to be competitive after all. I just don't think that the burden of most of the remarks that have been made today about the importance of this field to the world at large really allows us to be timid. I think we have to say to ourselves that even though the committee that set up this particular symposium was preemptive to select 1980, it might just as well have said 1990 or even 2000. Maybe the content of the discussion wouldn't have been all that different, but the importance of the time scale of the other inventions quoted by Derek would have then been appropriate. I don't think it makes much difference whether information science really fills the bill for society now or in the year 2000. I think it is important that we should survive in the meantime and I just hope that we don't feel that somehow we can take our eye off this ball and that God will provide.

D.H. BARLOW -

I think that Don and I discussed this over coffee and I think the impression I don't want to give is, O.K., "we've got eight years, we can relax". What I am really saying is that at the end of those eight years we've got to have the solutions done and ready and operating, because we won't have any more time. I think the other thing that I didn't emphasize enough is that there are pressures on us all the time which will be causing us to look at new innovations, look at new ideas.

I quoted some costs going up, distribution going up, so that all of these are incentives to find new techniques, new ways to make thing operate better.

I.L. AUERBACH -

I'd like to make an observation which differs somewhat with Derek's position, but it differs because I am using a different basis on a study that I have done on the time lapse from concept of an idea to its first commercial application, which is quite different than mass production. I take no issue with your mass production, but the study that I conducted indicates that there is an exponential decrease in time that has taken place over the past two hundred years, between the concept of an idea and its first commercial application. The first commercial application, for example, on transistors was not 16 years but closer to 9 or 10 years. The transistor was developed roughly in 1948 - 1949 and, in fact, I delivered the first transistorized computing machine in 1957. This was a machine of which there were three models, so it was not just an experimental model. It was a field model that was used in the guidance of a missile.I think this is one example. If we looked at the computer exhibit that is in the front room of the Academy, you will note that there is a similar exponential decrease in time cited in many of the innovations that are shown there. The hand-held calculator is a 2-3 year cycle. Now on the other side of that story was a conference held by the IAAA in February of this year on the issue that Derek, I believe is addressing, as to where do we stand with regard to technology and do we expect many new break-throughs and are we going to see major changes. Supporting his position was a greater degree of pessimism than I have ever heard from computer people talking about major break-throughs. But right through all of this, even though no major break-through is apparently lurking in the laboratories yet unannounced, was the point that we are going to see significant and major improvements in both technology and the cost of devices. I believe that we cannot underestimate the significance of the decrease in cost in the applications of technologies. I only have to cite the cost to manufacture an integrated circuit chip that has led from a very high cost of 15, 10, 12, lets say 8 years ago, to its cost today. You can now buy a device that will do everything that a large electronic computer would do and hold it in the palm of your hand.

D.B. BAKER -

I am worried about Derek's problem. We have heard from Auerbach that computing is going to give us all the power and capability that we need and want in the years ahead. Now about this intellectual problem of control of the literature. If, in fact, you segregate/desegregate your physics databases so badly you will wind up in chaos. Chemistry is a big field ; we had 450,000 reports to control last year. If we break this out and separate it into 50, 100 or 200 different packages and take only those that would be useful for the time being then we have a real serious problem in the years ahead. There is no one in this room or in this world that can say what is going to be important in the years ahead. What we need to do is build the systems now, and keep them unified and coordinated so that we do cover the research that is important 20 years down the pike. If you separate and desegregate your data bases as you said we should do, then we've got a serious problem ahead to control literature for the future.

D.H. BARLOW -

I think we may have a language problem. Desegregate I take it means integrate but what I really said was diversify, I thought. The idea was, that from the databases that we have now, take our own in physics, we feel that there are a number of products that one can produce. We have a range of products that we are dealing with at the time. There is no concept in my mind of splitting that database up. What I mean is that we will have to add value, add new bits of information, like an analysis of whether a particular article has innovation, a quality assessment. So we are adding a new service in a different direction. We keep the old one, that is our base from which we get everything we can. We are then building alongside new diversified activities in other fields, like economic data. I certainly never said and would never wish to have it conveyed to me that I was splitting the database up into bits.

A.K. KENT :

I think what troubles me about all of this is that it has been tacitly assumed, that primary publishing is going to continue to be the same as it was during the 17th century. Baker is talking about systems to handle this literature, [illegible] is talking about volume, [illegible] is talking about other parts of articles. Now I don't want to get us far off the track into primary publishing but it seems unfortunate that I draw from all of this the basic assumption that that is not going to change. I think there are a lot of indications that something is going to change in that area.

D. FINK :

Can I ask the panel to answer some questions along that very line ? Are we going to find that the economics of primary publication are going to force many of the marginal types of publications out of publication entirely so there simply is no primary publication in a particular area? Or is there going to be some rescue operation which will prevent that, but will not burden the publisher with any task except to get manuscripts, to see that they are properly refereed, that they are edited and they are available for injection in non-hard copy form? Which way is it going to go? Because if it appears that a lot of innovative work that isn't very popular right now but will be desperately important 50 years from now, is never going to be published for economic reasons, we had better do something about it.

I.L. AUERBACH -

Let me conjecture for you a couple of viewpoints. At the moment the ability to store information on magnetic media, or machine readable media, is rapidly approaching the cost of storing it on paper. However, accessing the information that's in machine readable form is a much higher cost than accessing it on paper and that, I think, is a point that has been lost to some people who are looking at the issues. May I just give you a couple of examples that we have looked at. Let us take a major publisher of primary journals who will sell copies to a wide audience as well as libraries, and as a result of the advertising that these journals may carry, he can sell these journals at modest prices, be they $ 25 or $ 50 a year. If on the other hand you say you only are going to make this available in machine readable form, the cost to acquire this now must go up because the subscriber base is going down. At the moment, we do not find people quite willing to use microfiche the way everyone alleges they are going to do next year. The concept that next year we are going to have microfiche in use the way we have paper, has never come about and has been predicted now for at least a dozen years. I do not personally believe that we will see microfiche eliminate paper, as many of the people in that industry continue to say. It is still an inconvenient media whether you use it at your desk or whether you want to read it on a train or whether you want to read it in your living room at home.

On the other hand, I also don't see magnetic tape replacing paper. So I am from the school that says I don't see a major elimination of paper as a means of publication in the immediate future for the members of professional societies.

J.W. BARRETT -

Yes, I thought I was going to disagree with you but I think what you said at the end straightens me out. My view would be that the archival journal will shortly be a thing of the past but the formal journal is the thing that will continue. But there are a great deal of archival journals which are still printed on paper and I would have thought that was the area of change.

L.G. BURCHINAL -

How are the libraries going to cope with the archival problem then?

J.W. BARRETT -

On microfiche.

L.G. BURCHINAL -

But you just said that the units don't like using microfiche.

J.W. BARRETT -

For current awareness, they don't like it, for reading on the train and in the sitting room.

L.G. BURCHINAL -

As we talk about the primary journal I think we make a mistake in not differentiating between the media in which you choose to store material, and the media in which it is presented to a user, and I apply that particularly to the micrographics field, in which you take the full cost including storage, heating, lighting and ventilation of storage area today, you find that microforms represent the most cost effective media for storing large quantities of material. So we could conceive of a system whereby a great deal of primary publications, particularly for archival purposes, would be in a micrographic form for storage in the libraries or information centers and then you will use publication on demand, print on demand and microfiche or hard copy for the user. If he wants it in hard copy, he pays an extra amount for that added benefit. But compared to digital storage, the micrographics are far more cost effective and certainly compared to paper. So to answer Don's question, [illegible] to prognosticate into the next decade, one of the major changes that I would expect to see would be much greater micrographic publication ; relying on the secondary services to really be the current awareness device, and then the full storage of material in micrographics with reproduction on demand. Some organizations like, well the American Chemical Society, I believe produce all of these journals currently in a microfiche issue as well as in hard copy.

I.L. AUERBACH -

What is the break-even point in the number of copies going from microfiche to hard copy that you have to attain before it is less expensive to create the original product in hard copy, and in microfiche for archival purposes? The number I heard most recently in New York was six copies and then you reach break-even. So I now pose the issue that if I am going to do more than six copies, it is more economic to print initially in hard copy for the people that would like to gain access to the information, and microfiche for archival. But if I have to go only to microfiche and then print on demand - one at a time - after the sixth copy, I am now losing economics.

L.G. BURCHINAL -

Well lets say from the initial time you get a manuscript and you type it in final copy, after some editing, and put it on some kind of automatic typewriter machine, bring it out in a nice clean copy, with no further key stroking, as microfilm from that, you will greatly reduce costs. There is a whole different economics depending on whether you go into initial micro-publishing compared to republishing something in micrographics that had originally been printed. Now that's one part of my answer.

The second part is a look at the total cost, including the cost to the user or his organization and the continued storage costs of maintaining something. Then you get about a hundred to one reduction and there is a great deal of economics involved there in favor of micrographics.

END OF PANEL II.

PANEL III

THE POLITICAL IMPACTS OF THE NEW CONDITIONS ON THE WORLD ORDER

Moderator : *A.K. KENT. UKCIS*

There is danger in reckless change; but
greater danger in blind conservatism.

Henry George

SOME CONSIDERATIONS ON INFORMATION TRANSFER FOR DEVELOPING COUNTRIES

Adam WYSOCKI

ABSTRACT

The present stage of United Nations activities is marked by the rich-poor dialogue, or development efforts for the Third World which will probably continue through the 80's. In order to eliminate poverty and stabilize the political situation of the world, while ensuring the developing world of continuing access to essential resources, technology must be transferred to the emerging nations. This only can be done by creating within those countries the political will to fashion a strategy of self reliance, the ability to design mechanisms for indigenous science and technology, and by correcting the existing imperfect conditions of the market for technology. The transfer of technological information will play a major role in these efforts. They must include information on alternative technologies, sources of supply, minimum costs, guarantees of delivery and specifications, and manpower requirements. In order to achieve this, national information capabilities must be organized in a coordinated manner to include the placement of infrastructures, training of personnel, improvement of communication, and access to international networks.

SOME CONSIDERATIONS ON INFORMATION TRANSFER FOR DEVELOPING COUNTRIES

Adam WYSOCKI

Director, UNISIST, UNESCO
PARIS, France.

The scope of this panel is to consider global political questions that must be answered - that is the adaptation of scientific and technological information to the new needs of the established and emerging nations; the legal-ethical questions associated with transnational delivery, and the responsibilities of both generators and users of information.

The subjects mentioned above are very complex and it is not easy to find the appropriate answers to the questions raised. It seems, however, that under all circumstances we should consider the following points:

a) the existing situation in developing countries, their needs and basic requirements;
b) the types of information needed to meet these requirements;
c) the mechanisms to be established and developed for information transfer.

In my report today, I would like to review very briefly these questions based on recent experience gained by the UN family.

EXISTING SITUATION IN DEVELOPING COUNTRIES -

It could be said that the UN has lived through different chapters of its existence in the last 30 years and that the present chapter is the rich-poor dialogue, the development struggle, which is dominating the 70's and will dominate the 80's too.

Two conferences held this year. UNCTAD IV in Nairobi, and the ILO's World Conference on Employment in Geneva, dealt with this question. Both arrived at the conclusion that the real problem is the reduction or elimination of poverty.

The World Conference on Employment underlined the poverty and inequalities in developing countries. It stated, inter alia, that poverty in the world today must be mainly understood in an absolute sense. Very large numbers of people throughout developing countries are absolutely poor, subsisting at a level endured by few people in the industrialized countries. The World Bank estimates that about 600 millions persons have a yearly income per head of less than US $ 50. Furthermore, it was said that income is very unequally distributed among, as well as within, countries and that these differences have become a central issue. In 1972, the industrial market-economy countries, with only 17 percent of the world population, accounted for 67 percent of the world total output. At the other extreme, 26 percent of the world's population lived in countries whose total output accounted for under 3 percent of the world total.

The current stagnation in the industrial economies and the recent changes in relative commodity prices have had complex effects on the global distribution of income. Increases in petroleum and phosphate prices have redistributed income to developing countries as a group. However, only about one-eighth of the population of the Third World live in countries which have gained significantly from this. About one-half live in countries that were adversely affected by high import costs for fertilizer and petroleum. Developed countries, meanwhile, have often managed to pass on their higher costs in the export prices of their manufactures, which has again worsened the position of the poorer developing countries.

The conference stated further that the main approach to reducing poverty must be the provision of productive employment to all those of working age. Assuming that three-quarters of the poor are of working age and capable of work, employment policy is three-quarters of development.

The UNCTAD IV Conference underlined, for its part, the technological dependence and especially the weakness of production and trade structures and financial dependence of developing countries.

If employment is three-quarters of development, technology is three-quarters of employment. Of course, other facts such as structural changes, land reform, fiscal policy, and more effective negotiations with foreign investors, all have their part to play.

In this connection, it was said that, although the application of imported science and technology over the last quarter century has brought some progress in accelerating the growth of output, improving standards of living and spreading modernization, the low-income countries still find themselves unable to meet the basic needs of the majority of their population.

In the 15 years following the Second World War, over 60 countries gained formal independence and the total number since then has grown to nearly 80. These countries entered political independence with a backlog of crushing poverty, massive illiteracy, and little accumulated capital or industrialization experience.

The UN experts specially charged with the question of technology transfer confirmed this diagnosis. They say that the basic situation of developing countries is one of general technological dependence. This is due to many factors: the lack, in many developing countries, of the political will to fashion a self-reliant strategy for both development at large and technology in particular; a lack of will and expertise to design policy instruments and mechanisms, including a "Science and Technology" plan, which will serve to internalize the demand for technology and actively promote indigenous supply; the prevailing imbalance between the scale and quality of foreign and local sources of technology, the imperfect conditions of the international markets for technologies, which tends to offer strong incentives to the seller to make technology available only in "packages," and the marginal involvement of the national scientific and technological system in the selection and acquisition of foreign technology and in meeting even a part of the local demand for technology. Unless this tendency is changed, and some urgent national and international action taken, developing countries are unlikely to be able to control their future. There are at least two broad stages at which such action is needed. *First*, there is a need to build up an indigenous technological capacity in developing countries, at least adequate to adopt and transform consciously selected foreign technologies, so that they are not only better matched to domestic social and economic needs, but are able to constitute the spring-board for indigenous technological development. *Secondly*, there is a need to use the whole range of available economic policy instruments to sharply reorient the demand for technology towards indigenous sources of supply. Transfer of *technological information* should play an essential role in this change.

These are considerations of the two recent UN conferences on a few aspects of the present situation in developing countries. Of course, this analysis is not complete, but it is sufficiently clear to show that this situation must be changed and the existing inequalities substantially diminished if the new international economic order is to be established.

Mr. Mackenzie, the former British minister to the UN, in answering the question "Why are we so excited about the Third World?" mentioned three reasons for giving this theme top priority:

First - Is the moral reason for focussing on this subject - mainly because the enormous discrepancies between the affluent minorities of the world, and the impoverished majorities, are wrong.

Second - Is the political consideration. A world situation like that cannot be safe. With a world contracting in size, with population exploding and with information flowing back and forth ever more rapidly, this is inherently an unstable and dangerous situation. Adam Smith in "The Wealth of Nations," published 200 years ago, said, "No society can surely be flourishing and happy of which the far greater part of the members are poor and miserable."

Third - there are economic reasons for giving this subject priority. Most of the developed countries are dependent on imported industrial raw materials located in developing countries - and therefore a dialogue with the areas of the world from which raw materials come must be established.

TYPES OF NEEDS -

The ILO study on employment also defines the basic needs of developing countries. They include two groups:

i. Minimum requirements of the family, for private consumption: adequate food, shelter and clothing, household equipment and furniture.

ii. Essential services provided by and for the community at large such as drinking water, sanitation, public transport and health, as well as education facilities.

The fulfillment of basic needs in the poorer countries of the world cannot be achieved by redistribution of goods currently produced. Not only the structure of production must be changed, but the total amount produced must also rise over time. For this reason, it should be stressed that the rapid rate of economic growth is an essential part of the basic needs strategy. As a consequence, the highest priority is given to technology transfer, including technological information.

The UN Secretary-General in his report to be presented to the next (XXXI) U.N. General Assembly, will emphasize the role of technological information in the transfer of technology to meet the needs of users in developing countries. The important question, however, is what kind of technology is required by the developing countries. Hans Singer from the Institute of Development Studies says, "Those in charge of Third World policies are also often deeply suspicious of attempts to persuade them that the modern technology of rich countries is harmful to their development. They suspect that they are going to be fobbed off with a second tier of "primitive", "simple", "non-progressive" technology. While they readily subscribe to the aim of technological autonomy and independence, they also picture technological autonomy as sharing control of the same technology. This is a tragic error. What is needed is not a second tier, primitive technology, but an equally modern, equally efficient, but different technology designed to produce different products with a different combination of resources, in different locations and with different forms of business organization. The non-existence of a second modern technology is one of the biggest gaps on the development scene today."

It is important to distinguish between three types of separate, although inter-related activities in the field of technology, so far as information requirements are concerned. First, at the policy formulation level there is a need to draw up national policies relating to foreign investment, contractual arrangements for the transfer of technology, local research and development, government procurement and the initiation of large-scale public projects, and other matters. The adequateness of the policies adopted must be monitored constantly and periodically re-evaluated and modified. There is thus a need for a continuous flow of information about development in technology related areas both at home and abroad.

A second type of activity is related to the evaluation and selection of projects at the micro or enterprise level. What is required at this stage is information about alternative technologies and sources of supply, including information about minimum costs, terms and conditions, technological specifications, guarantees, delivery and implementation schedules, resource and manpower requirements, etc. This information should enable the recipient to unpackage the technology, make the optimum selection and negotiate effectively with suppliers.

The third type of activity covers local design, engineering and R and D. The successful adaptation of foreign technology to local conditions and the generation of local technology depend directly on the national capability in these areas. The information required for these activities is mainly of a technical or scientific nature.

MECHANISMS TO BE ESTABLISHED -

Generally speaking, two main groups of mechanisms of information transfer should be established in order to satisfy the urgent needs of developing countries. These are: effective international co-operation and development of national information capabilities.

i) Local capabilities should be available in order to:

a) stimulate and motivate individuals to utilize information;

b) determine and interpret user needs in order that information be procured from a user's perspective;

c) direct user information needs to the proper sources of knowledge and make adequate use of them;

d) analyse, consolidate, evaluate and assess the information received.

The development of national information capabilities must be organized in a coordinated manner. It is recommended by several international programmes that each country should have a national information focal point which would be responsible for the overall information policy of the country and would cover all disciplines and all areas of application. This focal point is concerned with all ranges of activities dealing with access, management and use of scientific and technological information. No other organization outside the country could better perform these tasks, especially when technology transfer is involved, than technological service institutions especially structured to undertake the mission of carrying knowledge to providing technical opinion to planners, implementors, policy-makers and other types of users. This implies the availability of organized information services, good communication among them, and equally important, the availability of trained personnel to operate the information services and to communicate technical knowledge to the users. In this respect, it is worth emphasizing the role of professionals trained in basic science and technology to operate as information communicators.

ii. In the last two years, we also have observed substantial changes in international cooperation, as far as transfer of information is concerned. Last year, the Seventh Special Session of the United Nations discussed and voted the resolution of development and intermtional economic cooperation (resolution 3362). Section III of this resolution says that:

> "Developed and developing countries should cooperate in the establishment, strengthening and development of the scientific and technological infrastructure of developing countries. Developed countries should also take appropriate measures, such as contribution to the establishment of an industrial technological information bank and consideration of the possibility of regional and sectoral banks, in order to make available a greater flow to developing countries of information permitting the selection of technologies, in particular advanced technologies. Consideration should also be given to the establishment of an international centre for the exchange of technological information for the sharing of research findings relevant to developing countries. For the above purposes institutional arrangements within the United Nations system should be examined by the General Assembly at its thirtieth session."

The United Nations General Assembly at its thirtieth session adopted resolution 3507 on institutional arrangements in the field of transfer of technology; in this resolution the General Assembly:

- Reaffirms the importance of wider dissemination of scientific and technological information, the need to enable developing countries to have access to specific information on advanced and other technologies requested by them, as well as on the new uses of existing technologies, new development, possibilities of adapting them to local needs, and the need to enable developing countries to select technologies which meet requirements;

- Requests the Secretary-General to establish an interagency task force, which should use the widest possible expertise in the fields of information exchange and the transfer of technology and, taking into account the views expressed in the Committee on Science and Technology for Development, undertake a comprehensive analysis, with a view to the preparation of a plan for the establishment of a network for the exchange of technological information and to submit a report containing preliminary recommendations, through the Economic and Social Council to the General Assembly.

As a follow-up to these resolutions, the third session of the Committee for Science and Technology Development of ECOSOC, discussed the proposals of the United Nations Secretary-General on the role of an international technological information system in the transfer and assessment of technology and in the indigenous growth of appropriate technologies in developing countries, and recommended several actions.

At the same time, a United Nations inter-agency task force of information exchange and transfer of technology, which groups all interested agencies of the United Nations system, considered the coordination of international efforts in the transfer of technological information from developed to developing countries.

This task force prepared a report for the UN Secretary-General on the establishment of a network for the exchange of technological information. We can hope that this concentrated action of the United Nations family will provide essential output for the improvement of scientific and technological information activities in the less developed countries.

GLOBAL POLITICAL FACTORS.

Lee. G. BURCHINAL

ABSTRACT

The sharing of scientific and technical information with the developing countries is a global political factor that will continue into the 80's. Access services will benefit from this awareness and will continue to effect the technical advances that they have contributed in the past. The next decade will see full-text searching in natural languages combined with distributive networking. It will be imperative, however, to protect and stimulate the economic viability of the private services while meeting the developing countries' user needs. While the United Nations agencies should coordinate their efforts in assistance, the development of more government-sponsored international systems should be the subject of a moratorium. The apparent benefits of such systems to the developing countries could disappear and become net losses. Redundancies and duplications will add to those that already exist. Developing countries should be assisted to reap the benefits of the existing private, as well as the governmental decentralized services by providing funds necessary for access to them. But developing country capabilities must also be developed through education and training programs; user-education programs; establishment of national focal points through which to establish means for assessing the effectiveness of all services; and by stimulating regional cooperation and resource-sharing among national systems.

GLOBAL POLITICAL FACTORS.

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INTRODUCTION -

It is a pleasure to participate in this ICSU AB Symposium and, with my distinguished colleagues, to consider some of the global political factors that will affect information systems developments in the 1980's.

This meeting occurs at a very auspicious time.

At the global level, there is rising political interest in scientific, technical and technological information systems. This interest, as expressed in the Manila and Lima Declarations, the UN Resolution 3507, and various major speeches by Secretary Kissinger (Nairobi and Santiago, for example), calls for worldwide sharing of scientific and technological information (STI) as one way of redressing the economic imbalances between industrialized and developing countries.

Access services stand to benefit from this new political awareness of the value of information. Services, such as yours, also have much to contribute to achievement of politically-established information and economic development goals. With continued exponential growth in scientific and technical literature and data, accessing services have become indispensable .

for productive scientific and engineering work. Worldwide increases in on-line searching and operations of SDI programs illustrate this point.

Moreover, continued technological advances assure development of ever more efficient and effective ways of facilitating use of available information. Today's accomplishments in North America and plans for networks such as EURONET are only harbingers of the next generation of services. By the mid-1980s we should be well advanced in full text searching using natural languages. These advances will likely be combined with distributive networking arrangements that will allow users to move progressively from titles, to abstracts, to full text and on to data contained in various remote data banks.

International organizations have seen the benefits to be derived from more effective international access to information. Adam Wysocki has spoken of the UNISIST effort of UNESCO. In addition, among the UN specialized agencies, UNIDO, FAO, WIPO, and UNCTAD--probably others as well-- have or are developing information services in their areas of responsibility. New initiatives and directions, no doubt, will come from the next UN General Assembly, following debate on the UN Task Group report pertaining to Resolution 3507.

In contrast to these positive developments, there are serious problems that, if unresolved, could lead to potential future political confrontation in our field. If confrontations occur, they will be over ways of creating access to information in developing countries.

The developing countries are well aware of their present disadvantages in this area, and through their dominant position in every international forum, they intend to change the picture. Further, the very technological and telecommunication advances we proudly proclaim in Western industrialized countries will further widen differences with developing countries.

THE GLOBAL STI ISSUE -

The major global STI issue, then, in my opinion, will be how to narrow differences in access to scientific, engineering and technological information between the industrialized and technologically developing countries and how to help developing countries apply available information to achieve their national economic and social objectives.

In this context, international organizations and developmental assistance programs will become increasingly important. International organizations present the forums for defining problems, establishing priorities, and developing programs. Development programs of individual countries and international organizations such as the World Bank and regional development banks can provide necessary funding.

As information professionals, our task, it seems to me, is to help structure global politically acceptable choices for promoting international access to available information in ways that: (1) protect and stimulate development of economically-viable, effective services; while (2) meeting the needs of users in developing countries. Concentrating only on the latter could seriously weaken the bases of international STI communication, while focusing only on the former will do little to help developing countries. Improvements are needed simultaneously at both ends.

One way to approach this dual problem is to direct attention to needs within developing countries, and at the same time, give attention to ways of expanding markets for services, through added financial assistance for purchase of services based on choices made by trained persons in these countries. Six recommendations are offered along these lines.

RECOMMENDATIONS -

Several recommendations concern the responsibilites of the UN and its specialized agencies. These organizations are singled out because they can uniquely assist developing countries in strengthening their own capabilities.

1. UN agencies should concentrate their resources on helping the developing countries build their own information-accessing and using capabilities. This should be the primary STI goal of the UN agencies.

UNISIST objectives could serve to organize such efforts. Activities could include assistance in:

- Establishing national focal points;
- Planning, managing and coordinating development of information services designed to serve critical sets of users;
- Educating and training manpower required to design, manage, and operate information services;
- Developing user education programs, including development of instruction for university students;
- Establishing means for assessing the effectiveness of services and improving on-going operations;
- Stimulating regional cooperation and resource-sharing among national systems; and

- Facilitating the participation of information specialists from developing countries in international STI meetings, advisory groups, and policy bodies.

2. All other activities, such as development of international standards or policies for building systems interconnections, should be given secondary importance. These will likely develop satisfactorily through the efforts of international professional bodies, national and international standards organizations, and negotiations among the major organizations concerned.

3. The UN and its specialized agencies should develop means for effective coordination for their various information efforts. A beginning effort would include an inventory of all STI-oriented efforts sponsored by the UN and its specialized agencies. In time, this inventory could be progressively expanded to include descriptions of all significant STI services worldwide. In addition, some form of on-going coordination mechanism is needed. Otherwise, efforts of the UN and its specialized agencies risk being ineffective and diverting resources of developing countries into unproductive duplication and competition between uncoordinated activities pushed by various agencies.

It would also be useful to maintain an updated inventory of descriptions of the national information infrastructure of the countries of the world. With such a tool, decision-makers, planners, managers, consultants, and others around the world would have a common basis for planning and coordinating activities in various countries. This suggestion, was included among the recommendations of the Expert Group assembled in April in Vienna to assist in developing implementation plans for UN

Resolution 3507. The Expert Group also recommended development of an inventory of STI services. The UN Task Force Report (E/5839, 14 June 1976), however, limited its recommendations to development of pilot directory of information services controlled by organizations of the UN system.

4. The UN or its specialized agencies or other international bodies should not establish or promote new international bibliographic retrieval systems. This may sound harsh and arbitrary, but I believe it is time to declare a moratorium on developing new government-sponsored international STI systems.

I recognize that this position is contrary to most current views of how to solve international information problems. The approach favored by most information managers of international organizations and by representatives of developing countries is the decentralized international system, modeled after INIS. Representatives of some, if not most, industrialized countries are wary, if not openly opposed to development of further systems of this kind. This was demonstrated in opposition to SPINES, and may become evident when final decisions have to be made for DEVSIS.

If the issue is to be settled by votes in UN agencies, we will likely see passage of resolutions calling for expansion of decentralized international systems. However, one would hope that the advantages and disadvantages of this approach versus alternatives would be carefully weighed by information scientists in the various countries and by international organizations before countries become politically committed to building one decentralized system after another. Benefits, especially to developing countries, of any single decentralized international system are obvious. Each country gets records for the world's published literature on a given topic in exchange for its input. Every country gets back more than it contributes. Participation in such systems also can contribute to standardization and manpower development.

These benefits, however, rapidly disappear and could become net losses when analysis moves from optimizing for one area, as represented by INIS or AGRIS, to that of optimizing returns on total investments for all information resources across all fields of knowledge.

Furthermore, we already have a large number of accessing services. In its recent survey, NFAIS identified 2,300 abstracting-indexing services, of which 110 unique services were available in machine-readable form. New services will only add to the duplication that already exists. Moreover, private services have shown they are ready to respond to new information requirements. New types of specialized commercial services are being offered in response to market conditions. These include systems that combine literature and data searches with data analysis capabilitites (PEDICAST); patent descriptions (Research Publications); industrial product information (Information Handling Service); and descriptions of technology available for licensing and related information for economic development (DEV-CO-NET and TECHNOTEC). All systems just mentioned are offered by U.S. firms.

The number and variety of such services can be expected to increase as other industrialized countries join the U.S. in movement toward the post-industrial society. Developing countries can benefit from these as well as other private and governmental-based services, provided they have the funds to purchase them and are trained in their use -- which leads to the fifth recommendation.

5. National and international technological assistance programs should include provision of funds to developing countries for the purchase of needed information products and services. With development of national capabilities, ways will have to be found to help developing countries purchase the information resources needed to operate their services. Otherwise, national systems development efforts will lead to increased frustration as information managers and staff become aware of but cannot obtain information services needed by their countries.

What I am suggesting is an approach based on providing financial support as close to the users as possible. The minimum acceptable distance from users is the library and information system in developing countries. In this way, users or at least information intermediaries would be given maximum freedom of choice in selection among available information products and services. They would be able to choose among those offered by internationa bodies or public or private services in foreign countries.

With such an arrangement, we would have the basis for implementing my last recommendation.

6. The UN and its specialized agencies should develop means for assessing the effectiveness of STI delivery to users, especially in developing countries. Emphasis is at the UN-level because these organizations can play a unique role in stimulatin development of national systems in developing countries. Assessment can provide feedback information useful for adapting development efforts to changing requirements. UNISIST represents a logical organization to lead in this effort.

SUMMARY -

What I am suggesting is a general approach based on encouraging national systems development in developing countries in ways to give users and intermediaries maximum freedom of choice among available information products and services. Such an approach should contribute to long-term improvement in the effectiveness of global information services while meeting political requirements for contributing to economic and social goals of developing countries.

In this arrangement, the UN agencies would focus on strengthening national information processing and referral capabilities and on building linkages or networking among national, private, and international sources of information. In this instance, the International Referral Service of UNEP (UN Environmental Program) could serve as a model. Demand would determine which services are used and what new services are needed. Subsidies that may be needed to support services during their early years would be provided to organizations that serve users.

INFORMATION SYSTEMS IN THE CONTEXT OF A NEW INTERNATIONAL ECONOMIC ORDER

John E. WOOLSTON

ABSTRACT

Science information is universal in its application as far than being country or culture-specific. In its application, whereas social science information is often country specific. This assumes importance in terms of developing country requirements. For policy making decisions in many areas, each country must establish control over it's own information. Certain endeavors, such as agriculture, is an intermediate area in that regional, or related environmental information is adaptable between countries. But each nation must develop trained personnel to conform with the requirements for standard formats, file structure, etc. Bilateral trading between countries becomes very complex, whereas an international pool to which each state can contribute and extract information as needed is an excellent alternative. Under a United Nations cost sharing formula, each contributor can withdraw information free of charge and sell it in his own country for local currency. This arrangement is typified by INIS and AGRIS and responds to the aspirations of the New International Economic Order. By the late 80's it can be extended to DEVSIS for problems of economic and social development, and to POPINS for information on population policy, family planning, etc.

INFORMATION SYSTEMS IN THE CONTEXT OF A NEW INTERNATIONAL ECONOMIC ORDER

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As Dr. Fink pointed out in his contribution to this Symposium, I believe it is indeed important to distinguish between the type of information system that can best serve the exact sciences and the type of information system needed to serve the social sciences. In the exact sciences and in most high-technology applications, information is generally not culture-specific or country-specific. The significance of a study of the interactions of a nuclide with elementary particles will depend on many factors - the hypotheses underlying the study, the precision of experimental observations etc - but, once these factors are known, the conclusions will have the same validity in India as they have in Canada. On the other hand, the significance of a study of the interactions of a rural community with newly introduced health services will depend markedly on local factors. Such a study carried out in Bolivia will be of maximum interest in Bolivia; it could be of considerable interest in Ecuador or Peru, because of economic and social similarities; it will, however, be of very limited, if any, interest in Mali or Indonesia.

In the social sciences, information is very much culture-specific and country-specific. Indeed, for Bolivia, the really important social-science information is that which is generated in Bolivia about Bolivia. And the first priority for Bolivia is to know what information is available about its own society and its own economy. If a country is going to make use of up-to-date and valid information for its own more effective policy-making and planning, it must - at least - have its own nationally-produced information under some sort of bibliographic control, so that this information can be retrieved when needed. And this must be done within the country itself: to stay with our particular example, only Bolivians can judge what is significant and what is trivial within the Bolivian frame of reference. No-one else can do it for Bolivia, and no-one else should pretend to do so.

Between the exact sciences at one end and the very "soft" sciences at the other, there are many intermediate points. Agriculture, for example, is a typical intermediate case. Some agricultural information is of very general significance, but much of it is relevant only in the area in which it was generated or in other areas where climate, soils and farming practices are very similar. This location-specific and culture-specific characteristic of agricultural information applies, to a greater or lesser extent, over much of the spectrum : transportation, construction, industrialization, education - to cite only a few examples. So when we talk about what developing countries seek from us in the more industrialized countries, we must not assume it is simply that we put *our* information in some sort of order, and then that *we* offer it to *them*. Such a response is not only intellectual colonialism, it misses the point.

Let us come back to the question of socio-economic information. Each country, if it is to take advantage of the information-generating investments that it has made, must set up some mechanism to maintain its own inventory of its own information.

But, for this, it needs trained people and, if it is not to be isolated, it needs international norms to which it can conform when setting formats, file structures, and indexing and retrieval tools.

If there is an international program to establish these norms, and particularly if there is a training component to back up the main program, then there are also other very strong incentives for a country to participate. By participating, the country gains the option to trade its own information - which it needs to control anyway - for the information from other countries that are also participating in the program. While its own information is in the foreground of significance, the experience and knowledge of the rest of the world is significant too. The opportunity to exchange information has, in quantitative terms, an enormous multiplier effect. Given adequate selection mechanisms, the multiplier effect is very significant in qualitative terms as well. The not-so-magic formula is simply to do what you have to do in your national interest, but to do it according to international norms so that you can exchange it for what the other countries are also doing in their own national interests.

What does this mean from an organizational point of view ? How can it be made to function smoothly as a system? Clearly, if each country separately trades information with all other countries, the complexities are likely to be overwhelming.

The alternative model is for each country to put its information into an international pool, and for all countries to draw what they want from that pool. This implies a central focus in the network where the contributions of the countries are merged and from which the products are distributed. The central operations must then, of course, be under international management and control, and all participants must have equal voice in determining the policy and actions of the management team.

And, since each participating country has made a contribution to the global data base, each must be considered as having earned the right to exploit it, according to its own practices, within its own borders. Once, under a United Nations cost-sharing formula, the costs of the central processing and management functions have been paid, each participating country should be eligible to receive the data base free of charge. Within its own borders, it can charge for the services it generates from the data base, but then these can be bought for local currency. For the users, no foreign-exchange problems are involved; and each country is free, according to its own philosophy, to maintain the service within the public sector, or to turn it over for development by the private sector.

I submit that arrangements on these lines do respond to the aspirations expressed by the international community in the various United Nations resolutions that call for the setting up of a New International Economic Order. These resolutions call, among many other things, for "the transfer of technology... on a basis of equality." The type of information-exchange system that I have described does provide for the widest possible transfer of knowledge, and on a basis that could hardly be more equitable.

And what I have described is not just the dream of a wide-eyed radical. It already exists. It exists in the International Nuclear Information System (INIS) and in the International Information System for the Agricultural Sciences and Technology (AGRIS). These systems came into being because of the vision of John Sherrod who, back in 1965, first advocated a formula of the type that I am now supporting for the construction of international co-operative, computerized information systems. John Sherrod is a very pragmatic person: he realized that no entirely centralized information system can effectively and rapidly, cover all the world sources of information relevant to its subject scope - even if it is given big subsidies and charges high prices. And, even if it is given enough resources to approach the goals of comprehensiveness and instant reporting, the centralized system is still limited by the perceptions of its own management - a view of the world from a single vantage point. The international co-operative system establishes, by contrast, a management that must be responsive to many different perceptions of what is needed - but all equally valid.

The solution represented by INIS and AGRIS conforms with the underlying One-World principles of the New International Economic Order - in fact, INIS and AGRIS are among the very few functioning manifestations of these principles. But the solution is also pragmatic. INIS works: it is now covering more than 90% of the world's new nuclear literature - quickly, with deep indexing, and with generally adequate abstracts.

And, as a foreigner in the United States, let me take this opportunity to pay tribute to the generosity of this nation in its contributions to the establishment of INIS. Before INIS achieved its present success, the world's most respected information service in the nuclear field was Nuclear Science Abstracts, a service that had earned great prestige for the United States. The last issue of Nuclear Science Abstracts is now off the press. It has been phased out in favour of the international service that has taken its place. But this changeover could not have happened without the generous cooperation of the technical staff of the former Atomic Energy Commission and the goodwill of its management.

AGRIS has not yet achieved the same success as INIS, but it has come a long way towards that goal in the short 18 months since its start-up. Its achievements have come despite enormous difficulties, some of them intrinsic in the vast scope of the subject matter and the formidably complex nature of existing agricultural information services. Other difficulties have resulted from the lack of a clear-cut political agreement among nations, but the adherence - now - of 67 nations augurs well for the continued growth and strength of the system.

By the late 1980's I believe we could have built something like twenty international systems on the INIS/AGRIS model - more in the "softer" than in the "harder" sciences: DEVSIS for central questions of economic and social development, POPINS for population policy, family planning, etc. and other systems for public health, human settlements, water management, natural resources, computer applications and transportation. How can they be brought into being?

Those of us who share this view of the future cannot rely on the secretariats of international organizations to take the necessary actions. These organizations have no authority except that vested in them by the member governments. Secretariats can propose, but they can only do what the governments order them to do. So it is for governments, first individually and then in concert, to set their priorities and to call for action in the appropriate international bodies.

How seriously do governments view programs of this type? Not, I would say, seriously enough. The expenditures, in terms of international money, are just not big enough to engage the attention of Presidents, Prime Ministers and Secretaries of State. One system, covering perhaps 100,000 new records per year, needs a budget (international money) in the order of a million dollars a year. This gets little attention when far more costly, but more easily comprehended, programs are at issue.

And, within each country, there are institutions whose first reaction is to resist the changes that the advent of an international system would cause. While it might almost be an axiom that institutions will resist change, this is understandable. Individually the institutions may have reasonably good services in operation. They have invested heavily in systems design, in building acquisition arrangements from many different sources, and in training staff for the very operations that they are now performing. To embark on a voyage of international co-operation is a little frightening. How much will it take away our own control over what we do? Can we rely on the other countries to play their part? What security do we have for the continuance of any arrangements made? So the domestic institutions, while not necessarily lacking in goodwill, seek so many re-assurances that they tend to put a brake on the diplomats - who did not have a strong incentive in the first place.

But nothing succeeds like success. Because of the success of INIS, more and more suggestions will be made to profit from this experience in other fields. Politically, countries taking the leadership stand to earn considerable prestige and respect. For, in the 1980's the developed countries will not be judged by how many billion dollars of aid they are giving to the developing countries (from us to them); much more they will be judged by their readiness to join in co-operative endeavours on a basis of equal partnership. Already, the signal is clear: are we in the affluent societies prepared to share our information - our experience, our knowledge and our skills? or do we seek to hang on to these for our own economic advantage? And doling out only what the rich think is good for the poor is no answer - that merely retains states of dependency and deprives us of the enrichment that the experience of other very different societies can bring to our own.

In our Western societies,many have seen the New International Economic Order as a threat to our standard of living and our freedom of action. But it can, just as easily, be a great opportunity. Especially so for information scientists. Here, in our own profession, we really can do something to better the world. By pooling our resources and our efforts with those in other countries and by accepting compromises in the norms of information handling, we can build systems that will make man's knowledge and experience available throughout the World, on an equal basis to all societies. It is worth a try.

DISCUSSION

A. WYSOCKI -

I would like to make two comments relating to Lee's introductory remarks. He made a very strong statement against more intergovernmental services. This is perhaps in my opinion too strong a statement, although I agree with him under certain conditions. If the new proposal is duplicating the existing service or services, I agree that there is no need for a new service. If there are no special users' needs for the new service, I also can agree, but if we have linguistic questions to be solved and a new service is necessary, for example, for Chinese or for Bulgarian, why not? I understand Lee's position. Perhaps there are too many services, but the statement as such, is too strong. Second, I agree with him when he said that there is a need for better coordination of international initiatives, especially at the U.N. Level. This is a very urgent need and we are all concerned, and we would like to arrive at the best solution for coordinated efforts. However this is also a positive sign. This multiplicity of uncoordinated efforts has shown that scientific information is a very important activity. A few years ago almost nobody attacked this problem, only a few organizations or a few people at the international level, and now we are observing that all international organizations are starting with information activity. This is a very encouraging sign.

L.G. BURCHINAL -

Yesterday we talked about optimist and pessimist, if you want a good living example of an optimist, I think it is Adam. Not only is the environment in which he has to work and produce favorable results difficult enough, but Adam also has shown how you take a problem and give a very positive complexion to it, namely the coordination issues within the UN and the family of agencies. Personally, I believe that there is progress. The creation of the Task Force following resolution 3507 itself was a very positive step and that report does contain some positive suggestions which if implemented following the next session of the UN will lead to more effective services across the UN. What I was trying to suggest in that area is that we need some articulated differentiation of functions among the UN agencies. For example UNISIST very properly says it does not operate programs. It is not a system, rather it is an attempt, (I hope, Adam, I am quotin correctly here) to develop the framework in which we can get cooperative activities among national and international systems. So UNESCO and its objectives could provide the framework for a generalized UN approach in which FAO or UNIDO or these other organizations would carry out certain reasonably articulated activities in their subject fields, but with more coordinated planning, particularly as they impact in a specific country. I would like to devote just a few remarks to the interchange between John Woolston and myself. First, apart from obvious differences on the strategy of whether one develops decentralized international programs such as INIS or AGRIS, or uses another strategy, I think there were very large areas of agreement and we should underline the areas of agreement as we to seek or reach towards some consensus which we as information people may be able to present to our governments, and through our governments seek a more uniform presentation in the various international forums. After all we do send representatives, as John indicated, to those organizations, and through the policy bodies, the steering committees and so on, we do determine the major policies and programs of these organizations. John indicated the importance of each country, with emphasis on the developing countries, controlling its own literature. I believe we all agree absolutely. Now where a difference may come in is how far do you go beyond each country being able to cover its own literature and developing the means whereby each country has access to the literature in a specific field from all other countries? If I understand John's position, he would work toward formal international systems in delineated areas, each with an international center with the operation staff much along the model of INIS or AGRIS. The position I was arguing is, let's develop the national capabilities and stop there, and not push formal international organized means for pooling and exchanging. Rather using the model along the UNEP line which will allow the representatives in each country to know where to find the kinds of information under control of either governmentally or privately sponsored organizations. Call that networking if you will. I would further suggest the model that I was propounding may better fit the kind of technology developments that we anticipate in the coming decade, where distributive networking may be the means whereby a user secures information, without the individual needing to know how the system is conceptually organized. If we pursue the notion of each country using either its public or private means in developing its data banks then we can again let demand determine what kind of links develop through that distributive networking, and we can anticipate some of the technology that Mary Gardiner Jones was referring to yesterday where investments in large powerful satellites will have to be borne by the western industrialized nations and would represent a subsidy that would allow users in developing countries, for example, to have very low cost receiver and transmitting mechanisms. This simply represents one form of providing a subsidy, but using the technology and anticipating the developments that we know are going to be much more common by the end of the next decade. If one anticipates a technology then I would suggest that we begin to organize conceptually so that we can more naturally flow into use of that technology and not think of international centers where we have to collect all of the information, build files and then physically distribute that information back in paper or in tape or even transmit the whole file back electronically. Again, I would urge that we let demand and negotiations among organizations determine the structure of the files that are available in each country.

J.E. WOOLSTON -

To respond to Lee's last point, I think there is a basic understanding on what is most urgent, namely the development of a national capability in each country. Then a difference of opinion about how you are going to connect them and how you structure the interrelationships between the national bodies, and I am an advocate of linking them in international systems and I have three main reasons for advocating that approach rather than the one that Lee described.
The first concerns the development of the national capability itself. If people are doing something within the framework of an international system they can do it in a much more effective directed way. The business of bringing bright young people from the developing countries and putting them through graduate schools of information science in Canada or the United States has proven to be a pretty ineffective way of building national capacities. They learn all sorts of things which are not relevant to their needs at home. On the other hand, I think

we have seen very good effects from the AGRIS and INIS training courses where people have come for much shorter periods of time - two or three weeks - have learned a lot and have gone back home and immediately applied it so that they didn't lose that training. I think that by having an international framework, an international system, people can make investments in building personnel resources that they know will be used. The second thing is I don't believe that people learn how to exploit systems even though they have a satellite link to Lockheed, and so on. I don't believe that they can exploit these systems unless they really participated in the work of preparing for them. Unless you have been part of it, it's very hard to know how to take maximum advantage of it. Thirdly, unless one has a voice on the board of management one doesn't have an opportunity to ensure that the development of the system in the future is one that is responsive to one's own needs, and of course the other joy of the international systems is that they give all participants a voice in the management of it. Please let me make sure to clarify one misunderstanding that might arise. I don't think that this necessarily puts each nation's efforts into the public sector. When a country makes a commitment to participate, it doesn't have to do it within the government bureaucracy - it can designate any institution to perform that function for that country and that institution may be government, it may be academic, or it may even be private.

D.B. BAKIR -

I congratulate Dr. Burchinal for his practical and reasonable presentation. But I wish one of you would tell me, of the 77 developing countries as classified by the United Nations, what percentage, or how many of them have really expressed a basic desire or interest in gaining this kind of information and are dedicated to getting it to work? I have never heard this figure and I think its important perhaps to see which ones we can work with. For example, last year we published new research results from 130 nations. Of the 850,000 reports the developing nations contributed a minor fraction of that research. The reports will be classified as international research in science and technology. The question that bothers me is that these countries have asked us to rescind our copyright restrictions and I don't know how, maybe Dr. Burchinal or maybe Adam or John would care to say, what we can do to overcome this problem. They complain about the $3,500 that they must pay for C.A.. Now they are getting $ 30 billion worth of new research information with that ; so $ 3,500 is a small sum for the considerable volume of information that's involved. But we can't rescind or provide exemptions to developing nations any more than to other countries, and I don't see a mechanism to overcome this problem.

L.G. BURCHINAL -

Yes, I suspect a great deal of the furor, Dale, over copyright not only in the developing countries but in this country, is that the people who buy the stuff just don't have enough money, to meet the needs of the patrons or groups they represent. I suspect that's as much the problem behind the library concerns about copyrights in this country as anything. If they had all the money they needed, then who would care what the cost was. I purposely was weak on the fourth point because it's a bit uncomfortable for me as a Federal official to make any recommendations that may result in increased assessments for the U.S. government in any international organizations, but I felt it was necessary to at least register the fact that in addition to capability building which could be supported development training, technical assistance, and so on, plain money is going to be needed. The developing countries don't have the hard currencies to purchase the materials which are available. There are several ways in which we could consider strategies to provide money. Unesco runs a coupon service, it's a rather small program as I understand it, but at least it does give developing countries coupons which they can use when they buy educational materials or books. The coupons are redeemable by the supplier that supplied the material. That kind of effort could be expanded. Now, where would the money come from? If Unesco believes it's important enough, then let them take it out of some other program. If the developing countries really want it and there is no budget increase then let's readjust priorities if it's that important.

Another possibility is trying to get the monetary-fund type bank that is concerned with development to recognize that a part of technology transfer does involve access to appropriate information that is going to cost money. Perhaps in the development plans we can get monies earmarked that would allow these developing information centers, libraries and so on to have the funds. A third possibility of course is to interest the aid programs in the various countries to become more involved. If we are serious about helping to effect transfer, and simply not having the money is part of the problem, then it seems to me we should explore some of the alternatives. If the funds were available then questions of having unlimited licenses to copy and so on probably would recede or perhaps suppliers would be willing to consider that a certain level of purchase would provide the license for at least a certain level of copying.

J.E. WOOLSTON -

Responding to Dale, Chemical Abstract Service identifies material on the basis of it being new original research. OK, I think in developing countries that there are people who are interested in new original research. But I think there are many more people - who are not as interested in that as they are in the purely how-to-do-it literature. This is not covered because, of your standards for Chemical Abstracts Service. That's why I say that I think there is a lot of scope for systems without redundancy with existing systems. On copyright, it's the publisher who is interested in copyrighting. The author just wants to see his work distributed as widely as possible and read by as many people as possible. But there is an interesting little gimmick that is used by INIS that I think is worth mentioning. We said at the International Atomic Energy Agency that any country providing a document to the INIS Clearinghouse was going to hold the Agency and all countries free from any copyright obligation when they copied it. In other words, the country that submitted it had to either buy out his national copyright owner, at least as far as foreign copyrights were concerned, or legislate him out, one or the other. That seems not to have impeded the supply of documents to INIS Clearinghouse. I don't think that there is any acceptable solution for developing countries to be able to say we are going to give you more money so you can buy our services because that still doesn't build up their self reliance, that still puts them in a position of dependency. They still don't know when the money is going to dry up, and what they are going to do after it does dry up. I think they want to join in the effort, I don't think they want to dominate, I think they want to cooperate, to be part of the whole picture.

J.R. SMITH -

There are two things that trouble me about your presentation, Adam. One is that you observed, I think, that developing countries were reluctant to accept any technology which was, in a sense a downgrade from the technology being used in the developed countries. If this applies to information systems, I think you have a potential disaster. Second, we have been using the world "information" and "information transfer" rather loosely this morning and an awful lot of it has been referring to secondary information products, bibliographic listings and A & I publications. I haven't heard anything about the back-up material for these references in the developing countries. It is going to be needed to make these tools of any use. As far as John is concerned, I am a bit concerned about his constant use of INIS as an example in reference to developing countries. I would have thought that was about the last data base that they needed. He mentioned AGRIS which I think is the only other one of its kind which is existing and its my understanding that AGRIS is in pretty serious trouble which we all hope that they will get out of, but that it does not in fact enjoy the tremendous demand that one might have expected, in a lot of developing countries. It could have been an extremely useful tool.

A. WYSOCKI -

In my statement I didn't consider the information technology. It was mainly oriented toward technology for producing the different goods. We are observing a situation in Unesco that the developing countries are, if not refusing the modern technology proposed by the developed countries, are suspicious, they are reluctant. They are thinking in terms of neocolonialism. They don't like to have this technology that is used by the developed countries because they think that in the future that they will be dependent on it. Therefore, they would like to have a different technology tailored to their specific needs. This perhaps is not compatible with the information technology which could be used and is used by some of the developing countries, but as far as the production of goods are concerned, this is a fact. My remarks before were to this part of technology, and not to information technology.

J.R. SMITH -

Two observations. Frankly, I feel uncomfortable going beyond the broad generalizations that I have offered when speaking about the developing countries. I think virtually everyone in this room comes from either a large so-called rich, or as one speaker indicated, one of the smaller though highly developed countries. None of us lives and works in the environment of a developing country, I feel we can't speak much about their needs or requirements other than trying to consider a broad framework as professional information people which we think will be useful in entering into the dialogue in the various international forums, and as representatives of, or influencing our governments in those forums. But from a professional information science point of view we are also concerned about trying to provide advice of the greatest long term value and produce the most effective services. Second, with regard to back up services, when I referred to information services and products, I intended to include current awareness services, printed material, access to SDI, retrospective, or on-line searching or any of the back up material which might be literature or data, patents licenses, descriptions of products, descriptions of performance, of innovations which might prove useful or what not. Here is where again I would emphasize that money is simply going to be needed to purchase that back-up material or to have access to it. In my remarks I didn't want to limit the consideration only to the access services, certainly those will be important and likely to become even more important and indispensable as literature and data and sources of information continue to grow. We do need the capability to have back-up to the materials cited in any of those services and that holds true in our industrialized countries, in our libraries, as well as in the developing world.

J.E. WOOLSTON -

He is absolutely right, atomic energy is not a fine subject of interest in most of the developing countries, it is in a few. INIS can be seen however, as a model, as having developed a methodology which could be extended and applied in those subject areas that are of interest to developing countries. As to the availability of the full documents in all of these systems, there has been a distinction made for copyright reasons of course, between the non-conventional documents and what is called the conventional. Conventional documents are generally journals and books and unconventional are everything else. In each of these systems there is, or there is proposed, a microfiche clearing house for the non-conventional material. In a system such as DEVSIS 60% of the material would be non-conventional, and the cost of the system incorporates the cost of the microfiche clearinghouse operation. AGRIS has attracted the interest of many countries. There are 67 countries who have responded positively to the Director General's invitation - the Director General of FAO.

I've sat in at many of the meetings of people from different countries, developing, developed, and mixtures of the two, on dealing with AGRIS and its building. I see over and over again the look on the faces of people from the developing countries, watching the representatives of the United States, and Canada, and the Soviet Union, and what they are saying is, "We are not really asking for your money, what we are asking for is your information." That you join this with the same enthusiasm that we have, so that your information will be there. We can do this as a joint effort! That I think is really what the developing countries are looking for, your leadership - I am talking to the Western countries now, your cooperation in the building effort, and I think we can overcome. Apart from the microfiche clearinghouse for the full text, there is in parallel with AGRIS another program called AGRONET which has the idea of establishing regionally, in different parts of the world, with supporting networking, major agricultural libraries that will provide photocopy service and will maintain interlibrary loans with each other.

J.W. BARRETT -

How do you justify, taking Ron's point, the continuing evolution of a system on the INIS model, that so far is the only other application and has run into very considerable difficulties. I think that's the essence of what Ron was trying to get to.

J.E. WOOLSTON -

How did AGRIS get started? - AGRIS got started because John Sherrod and Sir Thomas Scrivenor, one from the U.S., one from the U.S., went to then Director General of FAO and said

"We are each trying to cover the world's literature and neither of us is covering more than 50%. We think some cooperative scheme is needed. Please Mr. Director General of FAO, can you start some kind of study in which we will participate with the idea of developing a program?" It seemed in the beginning as it there was a strong initiative on the part of the Western countries. I think that many of us joined on that premise, that there was a strong commitment. I think as one proceeded, for all kinds of different reasons and in different places, that commitment was diluted, and the problem that AGRIS has now is whether the big Western countries have the commitment that people thought they had in the beginning. You know no one wants to make an investment if they are going to pull out. The European communities of course have really come through on their commitment. They are supplying a great deal of information.

J.W. BARRETT -

What gives you the confidence that the AGRIS model would not be a better reflection of the true situation in the world than the INIS model. Are you saying that one truth is better than another one?

J.E. WOOLSTON -

Mind you I am not pessimistic about this. I think these problems are going to be overcome. I think the momentum is there. I think the problem has been that there are five hundred existing partial services in agriculture or in segments of agriculture. What's happening is that government is afraid that it is treading of the toes of existing services now. They are having to pick their way through what is really a complex situation. Now if you take another field - take the economic and social aspects of development for example, then you don't have all that multiplicity of existing vested interest, you have a clean field and you can move ahead rapidly.

L.G. BURCHINAL -

Very briefly on this point, I do have to admit you present a very stout and articulate defense of your point of view. I think there may be danger in generalizing from the INIS model. The INIS program emerged at a time when just a few countries were doing the forefront research in that particular field; it represents a discipline that is very highly developed with a theoretical conceptual framework. Further it represents an area where post-doctoral students are very highly trained. The individuals recruited into the programs in the various countries are highly trained in their field and they share in that area - physics - a universalist set of concepts and all of the rest. This made international cooperation extremely easy relative to the soft-science areas we are speaking of Agriculture may represent an intermediate position but one in which our levels of training are less consistently high, where the concepts are less precisely defined, and the nomenclature is much more controversial, all of which I suspect will make the internationalized systems much more difficult. Now, SPINES or whatever it is called in Unesco, the developing countries want it, their spokesmen all want it, they don't know what it is, they are not sure what it's going to deliver. But the Western representatives right down the line, with the exception of Belgium who want to be the international center for SPINES, all indicated either modest or outright opposition. DEVSIS is coming along, SPINES was offered, but at least the countries that would supply the bulk of the contributions were opposed. The only major country that went on record in favor of it was the Soviet Union, and I believe they felt they had noting lose, because it wasn't going any where anyway. But otherwise the U.K., the U.S., West Germany, France, the other countries, were all negative on SPINES. Now I put SPINES in relation to difficulties that have been enunciated with AGRIS, and say this provides further reason to question the INIS-type model as the major direction we should plan to go.

J.J. LLOYD -

I wonder if the panel, in the short time that's left might consider this point. I would like to run a couple of things together. Lee said, that in listening to the discussions yesterday of the great miracles that are going to come in transmission systems and mechanisms, etc., in the 1980's; these things will probably not be extended to the developing countries and the gap between us will widen. I think he may be right and this, in a sense, was in the minds of the people who put this symposium together and set up the panels. One of the things we said was that we would face the phenomenon that a part of the world is moving into the post-industrial society while another great part of the world is just coming into the industrial age. How are we going to reconcile these social situations? This is one thing that will take good will and I wonder if the panel would talk about this. At the same time, John has said that what the developing countries are saying is, "give us your information", that may be so.

But I have talked to people from the developing countries, who have said, "when I have a problem I don't want to know how you are solving it in the United States. What I want to know is how it is being solved in any country in the world that is at the same economic level of mine, that has the same climatic conditions, as mine, and the same social situation as mine. I want to know what they have tried and how has it worked. I don't want to know about you or your atomic age." Now it seems to me that here may be the dividing line, or the bridge across this gap that Lee mentioned, that would be getting wider rather than narrower. Should there be a system built that will pass information from developing country to developing country, instead of just saying "we will give you the information." Is it conceivable that what we should be doing is helping them with the capability of generating their own systems to satisfy this new buzz word "appropriate technology"?

J.E. WOOLSTON -

One of the things that I said was that the developing countries are saying to the United States, "Put your information into the pool." It's not the whole thing, what they are really saying is "will you join us in the cooperative effort in which we all put our information into a common pool," and what they are going to extract from that pool may be a fair bit of United States information because there is so much of it, but also the information from all kinds of other developing and intermediate developed countries. I think there is a program in the United Nations Development Plan which they call technical cooperation among developing countries, where they say, "yes we could probably learn more from each other than we can learn from the big chaps because we are more at the same level of development." What is the motivation there? I think part of the motivation there is from a sense of frustration that we haven't been able to work it out this way, so at least let us work together. I think the plea from that side is not a direct continuous polarization but to find ways to wash out the polarization and to make it one thing.

A. WYSOCKI -

I would like to reply to your comments concerning Joel Lloyd's statement. He is perfectly right when he is saying that the developing countries can better profit from the developing countries than from the developed. Therefore comes the form of cooperation which is now proposed and is emphasized in regional cooperation. We are observing that in several countries in Southeast Asia. For example, when we say that in the field of scientific information, the U.S. or the Soviet Union, or France have certain achievements, they do not react. But when you say that in Singapore there is a system which is functioning well in the rubber industry, the people from Thailand are very interested. It seems to me that the most appropriate form is regional cooperation and we are encouraging that very much. Concerning SPINES, perhaps the answer will be given by the next General Conference. We will see if the developing countries and developed will agree to a larger system or not.

J.W. BARRETT -

I would like to make a brief comment on Dr. Burchinal's recommendation, asking the United Nations systems to coordinate their work. I think it would be useful to bring to your attention that the General Assembly decided to convene in 1979 a United Nations Conference on Science and Technology for Development. It will be a conference of decision-makers, not a science congress, and one of the major areas on the agenda will be the coordination and integration of the work of the agencies of the United Nctions. If the lack of coordination is seen any where more than it is at the United Nations itself, with many programs rendered ineffective because they work at cross purposes with other organs of the UN. It's not that there is not purpose or objective; I think the charter of the UN is one of the most noble documents drafted but in practice, each one of the agencies have their own. I think it's important to emphasize Dr. Woolston's comment; each one of the agencies have their own governing bodies and the governments do not speak always with the same voice. Unfortunately of the 144 countries, too many speak with different voices in different agencies and that's probably the major reason that a great deal of work is rendered ineffective in the field of economic development. At this conference in 1979, if actions are going to be taken to coordinate the work of the UN and to produce an important program, and to answer one of your concerns Dr. Burchinal, that is where we are to channel our resources; to the countries or to the international agencies. I think the answer has to be initiated by the governments. The governments who will send their decision-makers to the conference and they will produce the answers as to what is to be done in thefuture; not only in information systems, but in the applications of science and technology.

L.G. BURCHINAL -

This is very encouraging, we know of the conference that is coming and from that I think we all hope that there will be some clarification of the strategies, the approaches, and the mechanisms that would be used so that the total impact of all of the investments through the UN system are optimized and the information field being one case in particular. We have focused on a very specific area this morning. I think that is not surprising given the background of those of us on the panel, and we have focused on the developing countries. The reason for that is the present ferment within the UN-system as a result of Resolution 3507. Then there is the conference in 1979 so that this is going to stay as a very lively topic over a couple of years. The further thought that I wanted to get back to was we have other forums for arriving at some policies within the Western world. We have the OECD mechanism and one of its programs is to look at policy developments in the information field. One thing we might do if we can get some of our representatives to carry the message is to transfer this discussion among us as professional people in the information field, to the political level where national perspectives could be developed, and perhaps within the OECD, at least for those countries to see whether we can't come to some consensus on a framework or a direction we want to pursue in the international forum of the 1979 conference for expediting the effective access to information.

J.E. WOOLSTON -

I'd really like to follow-up on Lee's last point because I have been in discussion and correspondence with the three main groups in OECD who are affected. With the idea of convening an OECD meeting that would discuss these kinds of information systems, in particularly DEVSIS. I am sure these discussions would really be enforced by a request from you as the United States member, it would happen very quickly.

L.E. BURCHINAL -

Understand John, I am not saying information people should be discussing these, this should be at the political level to get a position that has political backing which means financial backing if that is required. We engage at the political level for discussing these issues.

END OF PANEL III.

CONCLUSION -

From the end spring new beginnings.

Pliny the Elder

CONCLUSION

Jorge SAHADE

ABSTRACT

It has been suggested that we already live in a post-industrial era with it's emphasis on information transfer. The International Council of Scientific Unions was influential in the establishment of UNISIST within UNESCO, and has created both CODATA and the ICSU Abstracting Board. Recent recognition of the problem of information transfer led ICSU to create a Policy Group on Science Information (POGSI) to counsel the ICSU Executive Board. The pressing socio-economic factors that were discussed here leaves us with a problem that we must cope with in both developed and developing countries. This symposium is only a beginning - I look forward to the follow-up.

CONCLUSION

Jorge SAHADE

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Ladies and gentlemen,

Yesterday, Jack Barrett approached me and told me that since I was wearing the ICSU hat, I should be giving the formal blessing so as to bring this symposium to a close. I don't know how to go about this, I know that if I were in the UK one could do away with this pleasant task very easily by saying a couple of words. If my articulation is right, and unfortunately I don't remember those words, I failed to seek the advice of my English friends here in this room. The information I have at hand is not enough for me to tell what one is supposed to do in the United States so what I am proposing to do is to say a few words. During the meeting several speakers have stressed the fact that perhaps we have already started living a post-industrialized era, the characteristic of which is the emphasis on information services. Actually, as you all know, ICSU has given early attention to this problem of information and has played a very important role in the establishment of the UNISIST program under Unesco, and has created the two bodies known as CODATA and the ICSU Abstracting Board. More recently, perhaps I should say very recently, ICSU awareness of the importance of keeping up with the needs of this changing world and this necessity of becoming more involved and playing a more active role in the field lead its executive board to appoint a Policy Group on Scientific Information.

By some mistake I happen to be the chairman of this group and I am beginning to learn this business of information, of which I am very ignorant. I have felt extremely privileged to have had the opportunity to be present at this symposium although I do not agree completely with everything that has been said nor sometimes with the approach that has been followed. I found it to be a most thought provoking and instructive exercise. Yesterday I thought that I would like to have been subjected to a more conflicting line of thoughts, although not necessarily arising from speakers from different background, but so that our perspective for the future would not have a brother-basis. I would have liked also to have heard in addition to a thorough discussion that would have taken into account not only the high technology of our times but also the human element from the socio-economic and political point of view, which might introduce deviation from any prediction base, on purely scientific and technological grounds. But this is a personal feeling which perhaps is due to the fact that I come from a developing country. This morning we have stepped on shifting ground. The political issues that are beginning to become pressing were discussed at length. We are leaving here with a problem that we have to cope with or else our lives will be strongly affected, both in the developed as well as in the developing world. Confining myself to the field of information and more specifically to ICSU action in this field, I would like to mention that the Policy Group is considering what can be done to help developing countries, and this will be discussed also with other members of the ICSU family. The Policy Group has met only once in Paris in January but it will meet for the second time here in Washington in October during the ICSU General Assembly.

Let me finish by congratulating the organizers of this symposium for the program they laid out and the roster of distinguished panelists they were able to bring together. This symposium, I am sure, is only a beginning. I look forward to the follow-up.

END OF THE SYMPOSIUM.